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ROENTGENOTHERAPY OF EPITHELIOMAS OF THE UPPER AIR PASSAGES.*

DR. HENRI COUTARD, Paris, France.

A study of cases of epitheliomas of the tonsil, pharynx and larynx treated by X-ray at the Radium Institute of Paris between the years 1920-1929, has shown that the clinical results of this treatment are greatly influenced by certain characteristics of the tumor and by some technical factors of the X-ray therapy. In the first group may be mentioned location, infiltration, clinically and radiographically appreciable extent, the microscopic structure of the tumor and of the glands. Under the second heading are included daily intensity, spacing and total duration of the treatment and the relation of these factors to the periodic variation in radiosensitivity of the normal and neoplastic tissues.

I. Relation of Clinical Results to Location of Tumor and Era of Treatment (Table I):

a. The anatomic situation of the tumor seems to have been one of the most important factors influencing the result of treatment. Our best five-year results were obtained in tumors of the tonsillar region, 32 per cent (21 out of 65 cases). Tumors of the larynx, 25 per cent (29 out of 114 cases), were next; and tumors of the hypopharynx, 11 per cent (23 out of 200 cases), proved least favorable.

*Read before the New York Academy of Medicine, Section of Otolaryngology, Oct. 16, 1935.

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TABLE I.
EPITHELIOMAS OF TONSIL, LARYNX AND PHARYNX —
FIVE-YEAR SURVIVAL RATES.

YEAR	TONSIL		LARYNX		HYPOPHARYNX		TOTAL	
	Treated	Survived %	Treated	Survived %	Treated	Survived %	Treated	Survived %
1920	7	2	8	4	7	1	22	7
1921								31%
1922	3	1	11	0	11	1	25	2
1923	3	1	12	2	8	1	25	4
1924								8%
1925	13	1	17	6	24	4	54	11
1926	13	7	17	9	20	3	50	19
1927								20%
1928	12	3	20	3	38	3	38	3
1929	6	4	7	1	35	4	48	9
1930								8%
1931								11%
1932								12%
1933								13%
1934								14%
1935								15%
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2151								231%
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2153								233%
2154								234%
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b. If these results are grouped in a table according to the years of treatment, they at first appear to vary with the era of treatment as follows: Of 70 patients treated between 1920-23 there were 13 (18 per cent) five-year survivors; of 142 patients treated between 1924-26 there were 33 (23 per cent) five-year survivors; of 167 patients treated between 1927-29 there were 27 (16 per cent) five-year survivors.

This apparently contradictory evidence, however, is readily explained when the greater frequency of epitheliomas of the hypopharynx during 1927 and 1929 is taken into account.

If we now separate these cases according to location of the tumor we find that the five-year results in epitheliomas of the tonsillar region were 30 per cent during the first, 27 per cent during the second, and 42 per cent during the third era. Laryngeal epitheliomas gave 19 per cent during the first, 34 per cent during the second, and fell to 18 per cent during the third era for some unaccountable reason. In the hypopharynx the respective variation was 11 per cent, 12 per cent and 10 per cent.

II. Importance of Radiographic Examination:

As inclusion of all neoplastic cells within the field of the effective irradiation is desirable and clinical appreciation of the true extent of the disease is difficult, all available means for determining the extent of the growth should be used and familiarity with the usual avenues of tumor spread should be a prerequisite for this treatment. The lower extent of epitheliomas of the larynx, and more especially the laryngopharynx, can frequently not be outlined by indirect or direct laryngoscopy. This may be done more readily by lateral radiographs of the neck.

Edema, especially if slight, of irradiated deeper tissues, which sometimes follows the initial X-ray treatments, may frequently be appreciated more easily by comparing radiographs before and during treatment than by laryngoscopic inspection. This edema seems to be unimportant in undifferentiated epitheliomas, but may signify increased radioresistance in differentiated types.

Radiographic examination seems particularly important in epitheliomas originating in the anterior part of the larynx,

spreading forward to surround the base of the epiglottis and infiltrating the pre-epiglottic space between the hyoid and the epiglottis where there is abundant loose connective tissue. Invasion of this pre-epiglottic space may become evident radiographically even before marked subjective or objective signs become manifest. With increasing growth of tumor the epiglottis becomes displaced, making examination increasingly difficult, and a tracheotomy may be indicated because of a sudden increase in dyspnea. These cases are frequently amenable to radiotherapy.

III. Metastatic Lymph Nodes:

General Considerations: Careful observations of the clinical characteristics of metastatic lymph nodes show certain variations between metastases from undifferentiated and differentiated epitheliomas.

Those from undifferentiated epitheliomas are usually large, often reaching 5 to 7 cm. in diameter, are soft, indefinite in outline, mobile, accompanied by periadenitis, locally tender, but do not give rise to referred pains. They are frequently situated at a considerable distance from the primary growth. After the first few treatments with X-rays, they begin to decrease in size and consistency and gradually disappear within six to eight weeks.

Metastatic nodes from well differentiated epitheliomas are usually small, often only 2 or 3 cm. in diameter, hard, sharply defined, more apt to be fixed, not tender, but accompanied by radiating pains. Similar to the primary lesion, they have a tendency to infiltrate and immobilize the adjacent muscles and other tissues, the node becoming indurated and its nutrition impaired. Following X-ray therapy they often become harder and more fixed. If even slight edema results from irradiation, this may interfere with the nutrition of the node and further reduce its radiosensitivity. The results of X-ray therapy in this group are poor.

The noninfiltrating and infiltrating epitheliomas of the pharynx and larynx have certain sites of predilection and information regarding the lymph nodes draining these areas is available.

Nodes Draining Sites of Noninfiltrating Epitheliomas:

The most posterior, the posterior jugular chain of lymph nodes, may be subdivided from above downward into three sets of nodes: the uppermost, at the level of the mastoid, serving the nasopharynx; the middle set, at the level of the angle of the mandible, caring for the tonsil; the lowest nodes draining the lateral and superficial glossopharyngeal tissues, particularly the borders of the base of the tongue, the glossopharyngeal fossae and the upper portions of the pyriform sinus. The sites of the primary lesions which drain into these nodes consist of loose connective tissue, rich in lymphoid follicles. The metastases are usually voluminous and, like the primary lesion, generally radiosensitive.

Slightly in front of the posterior jugular chain are the lymph nodes of the internal jugular chain. The superficial upper nodes correspond to primary lesions in the valleculae and lateral borders of the epiglottis and the superior part of the pyriform sinus.

In front of the internal jugular chain is the anterior jugular chain, which drains the posterior part of the ventricular cavity and the false cords. Metastatic nodes are moderate in size and, like the primary lesion, respond readily to X-ray therapy.

The most anterior chain of lymph nodes, the prelaryngeal, is found in the subhyoid and cricothyroid spaces. Metastases in this chain are not common. They drain the false cords, the pre-epiglottic and subhyoid spaces and the anterior portion of the larynx. These metastases, though usually small, are radiosensitive.

Nodes Draining Sites of Infiltrating Differentiated Epitheliomas:

Adenopathies from infiltrating differentiated tumors are usually small, deep, radioresistant and are frequently situated close to, or in contact with, the primary lesion. The groups of nodes may be classed as submandibular and carotid. They are away from the surface, may be fixed to the deeper tissues, and may be secondary to the deeper primary lesions of the fauces, and of the lateral wall of the pharynx and of the arytenoepiglottic fold, when the muscles are invaded.

The above information regarding the location of the metastases in the regional nodes has been of assistance, not only in predicting the radio-sensitivity of the metastases and primary lesions, but also in helping to locate hidden primary lesions which may be missed, as they are usually only a few millimetres in size and are covered by folds of mucous membrane. The improvement in the locating of the primary lesion is nicely illustrated by the gradual elimination of the diagnosis of epitheliomas arising in branchial rests or primary epitheliomas of lymph nodes. Forty cases were thus classed during 1920, 1921 and 1922, whereas during recent years primary laryngeal or pharyngeal lesions were not discovered in only four or five cases a year.

IV. Technique of Treatment:

A definite standardized technique was not used; on the contrary, wide variations of all the factors were employed.

1. *Physical Factors:* Voltage: Usually 200 KV., although sometimes less, with 5 milliamperes in the tube. Filter: 2 mm. Zn., +3 mm. Al. The focal skin distance varied according to indications from 40 to 60 cm. One lateral field on either side of the neck was usually employed; this was sufficiently large to include the primary lesion and regional metastases, the size of the fields ranging from 40 to 200 cm.

2. *Dosage:* Doses were recorded as r units on the skin, that is, with back scatter; 5500 to 8000 r representing the total surface dose usually given over all fields. The largest proportion of the dose was given on the side of the lesion. Total doses of less than 5500 r gave unsatisfactory five-year results, with the exception of three women who had thin necks and whose lesions were of limited extent. They were treated with 4600 r, 5000 r and 5100 r in eight, nine and 17 days, respectively. Only one patient treated with more than 8000 r survived the five-year period. Doses of 10,000 r and 12,000 r or more, often aggravated the condition of the patient and were followed by radiation injuries in the normal tissues.

3. *Duration of Treatment, Daily Dose and Type of Reaction:* a. *Short Duration of Treatment—Complete Radioepithelitis and Radioepidermitis:* During the first years of treatment, between 1918 and 1923, we employed a particularly

short duration of treatment and high daily doses, frequently giving as much as 600 r per day with a very small field. This produced destruction of the epithelium of the mucous membrane and of the skin, designated, respectively, as radioepithelitis and radioepidermitis. When these two reactions were of the desired severity, that is, without changes in the subjacent connective tissues, repair was completed in a few days without marked sequelae. With a total dose of 6000 to 7000 r administered in a period of 12 to 17 days, radioepithelitis appeared at the end of two weeks and radioepidermitis at the end of four weeks.

b. Long Duration of Treatment—Incomplete but Repeated Radioepithelitis and Radioepidermitis: Beginning in 1924, the treatment period was prolonged and the daily doses reduced. When 150 r daily are given for 50 days one observes a series of slight, incomplete, periodically recurring reactions of the mucous membrane and skin instead of the usual radioepithelitis and radioepidermitis occurring, respectively, two and four weeks after treatment. These reactions recur periodically after two, four, six and eight weeks on the mucous membrane, and after four and eight weeks on the skin.

If the results of cases treated between 1920 and 1929 are classified according to the duration of treatment, they may be grouped into seven categories, as given in the following table:

TABLE II.

Group	Duration of Treatment	Number Treated	Number of Five-Year Survivors	Per Cent of Five-Year Survivors
I	0-7 days	26	0	0
II	8-17 days	150	35	23
III	18-23 days	38	3	8
IV	24-34 days	94	19	20
V	35-38 days	20	2	10
VI	39-49 days	27	12	44
VII	50-77 days	24	2	8
Total		379	73	

From the above table it would appear that: 1. Groups II, IV and VI yielded, respectively, 23 per cent, and 20 per cent and 44 per cent successes. These cases were treated during an average of 13, 29 and 42 days; the epithelitis in cases

thus treated recurred on the thirteenth, twenty-sixth and thirty-ninth days, suggesting a relationship between the periodicity of the epithelitis, duration of treatment and curability by irradiation. 2. The survival rate of cases treated during periods having no apparent relation to the varying periodicity of the normal mucous membrane and skin was zero, 8 per cent, 10 per cent, 8 per cent.

Final evaluation of this information cannot as yet be made, but may become possible with the assembling of a greater number of cases treated according to this method.

Curie Institute.

THE ROBERT BARANY JUBILEE FUND.

During the spring of 1936 an appeal was sent to well known otolaryngologists in all countries, inviting them to send in, in connection with Robert Bárány's approaching birthday, first, a message of greeting to him, and second, a contribution — £1 sterling was suggested — toward a Robert Bárány Jubileum Fund, which was to be used in accordance with Prof. Bárány's decision on the basis of proposals made by the undersigned.

Since Prof. Bárány died April 8, we have decided to hand to Prof. Bárány's widow in Upsala the 350 messages of greeting which have been received; the contributions received and such as may be received later will be turned over to Upsala University as "Robert Bárány's Jubilee Fund." The interest on this fund will be used for striking a Bárány medal, to be awarded every fifth year by the medical faculty on the proposal of the professors in otology, internal medicine, neurology and ophthalmology to the author of the best work published during the past five-year period on "Static Sense" in the widest interpretation of the term. The collection will be continued until the end of 1936. Contributions will be received by the undersigned, address Sabbatsbergs Sjukhus, Stockholm, post office current account /postgirokonto/ No. 150241: Prof. Dr. H. Burger, Amsterdam; Prof. Dr. G. Holmgren, Stockholm; Prof. Dr. Fr. Leegaard, Oslo; Prof. Dr. Y. Meurman, Helsingfors; Prof. Dr. F. R. Nager, Zürich; Prof. Dr. A. Precechtel, Prag; Prof. Dr. E. Schmiegelow, Kopenhagen; and Prof. Dr. Z. de Lénárt, Budapest.

MALIGNANCIES OF THE NASOPHARYNX.*

DR. LOUIS KLEINFELD, New York.

Forty cases of malignancies of the nasopharynx have been examined in the Mt. Sinai Hospital in the last 10 years. As far as we have been able to trace them, all have died except two, treated a year ago, who are so far symptom-free and whose lesions have disappeared, presumably temporarily.

Except for four cases of sarcoma, these were all reported to be carcinomata, one of which was a basal cell carcinoma, six were squamous cell carcinomata, eight were lymphoepitheliomata (Schminke tumors), nine were transitional cell carcinomata, and 11 were said to be carcinoma without further qualification (see Slides I, II, III).

The average age of these patients was youngest in the squamous cell group, *i. e.*, 35 years, and the oldest was in the sarcoma group, *i. e.*, 50 years. The other groups ranged between 40-45 years. The youngest was a Schminke tumor in a boy, age 14 years; the oldest was a carcinoma in a man, age 68 years. There were no marked differences in the clinical course of the old and young patients, except somewhat better palliative results in the older patients.

The nature and duration of the first symptoms to attract the patient's attention presented some features of interest. In the Schminke group, about 40 per cent complained of symptoms referable to the eyes, about 15 per cent of nasal obstruction, and about 10 per cent had fairly severe pain or headache at the onset. The presence of enlarged glands was the presenting symptom in 35 per cent. The average duration of the first symptom before the diagnosis was made was six months, the longest being eight months. In the other carcinoma groups it was rather distressing to note that in about half the cases the very first symptom was enlarged cervical glands, presumably metastatic. Pain was almost as common, the remainder complaining of symptoms referable to the surrounding structures. The duration was somewhat longer

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than in the Schminke type, being almost a year in the transitional cell group. In some cases of this type, as well as in the unclassified group, the first symptom was present as much as three years before the diagnosis was made. No relation between the age of the patient and the duration of the symptom was noticed. In the sarcoma group, as in the Schminke type, almost half of the patients first complained of symptoms referable to the eye, likewise of about five or six months' duration, before the patient came to the hospital. The presenting symptom of the rest of this group was divided between pain and enlarged glands.

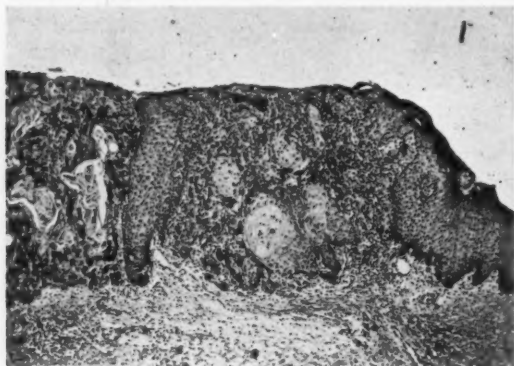


Fig. 1. Squamous cell (L.P.). Note pearl formations.

On examination, these patients, as was expected, showed on admission almost 75 per cent of presumably involved cervical glands. Hearing tests disclosed conduction impairment in about 40 per cent. About 50 per cent gave evidence of involvement of adjacent structures, such as the brain, cranial nerves and eyes. General metastases to the lungs and bony structures were rather rare in the carcinoma group on admission, being only about 10 per cent. Fifty per cent of the sarcoma patients had also sarcomatous lesions of the gastrointestinal tract. An extremely important feature of the examination was that routine examinations failed to reveal the presence of the mass in the nasopharynx in about five cases. Even when the mass was seen, one or more biopsies were sometimes reported negative (six times in three patients). Under these circumstances it was not unexpected to find that at least six of these people

had been treated for various ear, nose and throat symptoms for periods up to two years, in some cases, by well known specialists. Fifteen had been the victims of a total of 20 useless operations done from one to six months before admission, and ranging from craniotomies to radical sinus and mastoid operations. In one case, after a radical frontal operation with negative results, the patient was declared to be a neurotic.

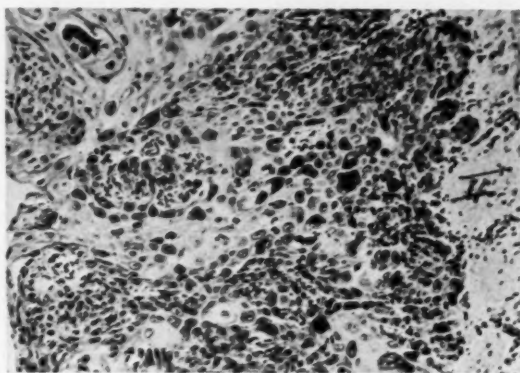


Fig. 2. Same as Fig. 1 (H.P.).

In another case, a patient who had been discharged from this hospital with a definite diagnosis of carcinoma of the nasopharynx was later operated upon by one of the country's foremost surgeons for suspected brain tumor. One of our most interesting cases showed on admission a condition resembling a chronic cavernous sinus thrombosis. Operation disclosed a Schminke tumor of the frontal bone with osteomyelitis. Laboratory aids were of little use in these cases except, of course, the invaluable biopsy. However, X-rays showed some evidence of a destructive process in the skull or sinuses in about 25 per cent. In examining these patients the use of the tubular Yankauer nasopharyngeal speculum was of great value, both in examination and in the removal of specimens. The local condition varied from a few small nodules to large ulcerated masses. In a few cases the removal of a specimen was associated with fairly severe hemorrhages.

The results of treatment on the whole were extremely poor. About the most that could be expected was a year of partial

relief of symptoms and then rapid progression to death, even when there was a disappearance of the mass under treatment. In general, the sarcomata did a trifle better than the carcinomata. The longest that any patient in either group lived in fair comfort was about three years. Treatment consisted in the majority of cases of deep radiotherapy, supplemented in some cases by radium. A small number had sinus operations done. One had the tumor coagulated.

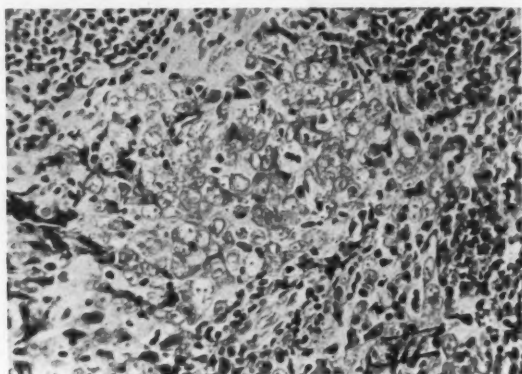


Fig. 3. Lymphoepithelioma (Schminke tumor) (H.P.). Note characteristic large pale cells.

In conclusion, I would like to emphasize the fact that these not uncommon tumors may occur at almost any age and that they are often undiagnosed. As a result, they are exposed to useless operations and treatment. Repeated examination and specimen removal will lead to a correct diagnosis in many cases that would be otherwise overlooked. The nasopharynx should be examined with great care in cases presenting cervical glands, unexplained head pains, conduction-lesion hearing impairment, interference with vision or mobility of the eyeball or eyelid, or evidence of involvement of the various cranial nerves. X-ray of the sinuses and skull may be of aid. Improvements in radiotherapeutic technique plus earlier diagnosis may possibly better the prognosis. Under deep radiotherapy, two cases of Schminke tumor, treated last year, are now symptom-free. Both the nasopharyngeal masses and the cervical glands have disappeared.

17 East 84th Street.

**FURUNCULOSIS OF THE EXTERNAL AUDITORY
CANAL WITH SPECIAL REFERENCE TO TREAT-
MENT BY BACTERIOPHAGE.***

DR. E. MARTIN FREUND, Albany, N. Y.

Furunculosis of the external auditory canal is reasonably common and often proves a trying condition to treat; trying primarily to the patient because of the severe pain and prostration and equally trying to the aurist because of the difficulties in diagnosis and treatment.

It is not, as is sometimes considered, a self limiting disease. On the contrary, it shows a decided tendency to recur, not only in the same ear but in the other ear as well. Otitic furunculosis may occur at any age and may or may not be associated with trauma. The etiology is often obscure, in which event it may be termed idiopathic.

The condition can be most refractory to treatment, and may present a problem in diagnosis, because of the difficulty of obtaining a good view of the auditory canal and the tympanum situated deeper at the hilus. Frequently, too, the swelling and displacement of the involved auricle may stimulate perichondritis, subperiosteal abscess, middle ear disease, or mastoiditis.

A furuncle of the canal is a circumscribed swelling of the membrane lining the cartilaginous or outer portion of the canal, this being the anatomical division containing hair follicles and ceruminous glands, structures that are involved in the infective process. The posterior portion of the canal being osseous in nature, its lining membrane is not prone to furunculosis.

At birth the external auditory canal shows no osseous portion. After birth, the newly developed bone cells develop about the tympanum, forming the anterior, inferior, and

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posterior walls. Then by the bending inwards of the outer plate of the squama, the superior wall is formed. The osseous canal is completed by the end of the first year, which explains why furunculosis of the external auditory canal is rather rare in early infancy. The cartilaginous, or outer two-thirds of the canal, is lined by skin containing sebaceous and ceruminous glands and hair follicles, structures not present in the osseous portion; therefore, a furuncle only can occur in the cartilaginous part of the canal, whereas a swelling in the bony canal, especially on the posterior wall, must be considered an extension of mastoid cell infection. At this location, only a very thin bony plate separates the antrum from the canal.

Etiology: Bacteria gain entrance into the involved canal by means of water, air and tactile abrasions, as well as trauma by dull or sharp points of metal or wood. These organisms find their way underneath the abraded mucosa, enter the pilosebaceous follicle, proliferate and eventually cause suppuration. In nearly all instances the organism is introduced from without, the exception being where contiguous or autoinfection takes place in a series of boils or carbuncles.

In cases where trauma is not a factor, there are usually found to exist debilitating disorders lowering the general resistance to infection, such as tuberculosis, diabetes, cardiac disease, trophic nerve changes and rheumatism. Or there may be present chronic skin disorders of the face and ears, such as seborrheic tendency, eczema, or other scaly affections. Excessive use of bromides has been mentioned as a predisposing factor. Occasionally one will see the condition accompanying or following an acute head catarrh. In these instances the organisms are undoubtedly introduced through the Eustachian orifice, working their way from the middle to the outer ear.

Trauma, that is, abrasion, nearly always self-inflicted, is the most common cause, the injury being produced most frequently by a hairpin, match, toothpick, or finger nail. The abrasion at times is the result of over energetic syringing or instrumentation during wax removal.

Symptoms: The furuncle does not differ from those of other locations, except that due to the thinness of the lining membrane, the swelling is more diffuse, covers a larger superficial area, and frequently almost occludes the canal in the early stage. The earlier signs are itching and discomfort in

the canal, due to the congestion of the perichondrium. Discomfort is experienced in mastication. Undue motion of the auricle elicits considerable pain. These signs become intensified during the next 48 hours; the pain in the ear being excruciating at times, radiating to the face, head and neck. Unless the canal is occluded there is seen a tumefaction of the superficial or all of the layers of the lining skin, most frequently situated on the floor or on the posterior wall of the cartilaginous portion of the canal. Tinnitus may be present and a throbbing sensation may be felt early in some instances.

Sometimes a tiny or infant-sized speculum will be required in order to permit a glimpse of the deeper portion of the canal and the tympanum. It may be impossible to obtain this view without causing marked pain; however, it is essential to rule out the existence of a middle ear disease, and by careful and patient manipulations, the effort will be rewarded. Due to Santorini's fissures that cross the anterior wall of the external canal to the parotid gland, the infection at times invades that gland and we then have a swelling in the parotid region.

A pathognomonic sign is pain in the ear on mastication. This is due to the direct relationship between the intermaxillary joint and the tragus. Otitis externa is often distinguished from otitis media, only by the difference in the degree of pain or tenderness caused by manipulations of the auricle.

Differential Diagnosis: Furunculosis must be distinguished from many conditions, principally aural polypi, perichondritis of the auricle, granulations of the external canal, exostoses, parotid abscess, carious teeth, and mastoiditis.

TREATMENT.

Abortive: Bacteriophage has proven a valuable agent in aborting as well as curing this condition in the early stages. A number of patients in my practice during the past six years have shown such prompt response to this method that I recommend the procedure before attempting any other form of treatment. Of more than 50 cases, less than 2 per cent required surgical intervention. The others responded satisfactorily to three to six applications, supplemented in most instances by one or two injections of the phage.

DIFFERENTIAL DIAGNOSIS.

	Furunculosis	Acute Mastoiditis	Aural Polypi	Perichondritis	Granulations of Ext. Canal	Exostosis	Carious Teeth
Previous attack	Common	Unusual	Rare	Rare	Common	Rare	Common
History of trauma	Present	Rare	None	None	None	No	No
Onset	Rap'd	Gradual	Gradual	Rapid or slow	Gradual	Gradual	Slow
Discharge	Yes or No	Usually present	Yes, long time	Absent	May be present	Absent	Usually absent
Intensity stage	Third day	1-3 weeks	Long duration	One to several wks.	Long duration	Long duration	Indefinite
Pain in ear	Intense in ear	Mild to moderately strong	Usually none	Moderate	Usually none	None	Seldom
Pain on mastication	Pathognomonic	None	None	At times	None	None	None
Hearing	Not much affected	Markedly affected	Mild to marked loss	Mild loss	Not affected	Not affected	Not affected
Canal stenosis	Usual & marked	Moderate at entrance	None	Usually none	None	None	None
Auricle displacement	Forward	Forward & downward	None	Mild, anteriorly	None	None	None
Mastoid tenderness	None	Marked	Marked	None	None usually	None	None
Drum perforation	None	Present most always	Present usually	None	None	None	None
Drum appearance	Normal	Inflamed	Chron. inflam.	Normal	Chron. inflam.	Normal	Normal
Tumefaction in canal	Fixed, 1 or more	None in canal	Present & movable	None	None	None	None

My experience has been limited to the preparations sold by the Squibb Co. and that of the Franco-American Co. The phage is obtained in 20 cc. vials and can be used either for topical application or hypodermic injection. It is also obtained in ampules of 2 cc. for injection purposes.

Streptococcus phage yielded poor results in the few cases tried. In contrast, the staphylococcus phage was strikingly effective in practically every case. This bears out results obtained by other investigators. The staphylococcus phage was helpful even in the instances where the streptococcus failed.

Bacteriophagy was discovered independently at about the same time by D'Herelle and Twort about 20 years ago. They demonstrated that bacteria possess a lytic substance filtrable through the Berkfeld or other filters, and that this substance is able to ingest and destroy other bacteria of similar strains. This is termed the Twort-D'Herelle phenomenon. Most investigators believe that this substance is inanimate, that is, an enzyme, or an activator of endocellular hydrolytic bacterial enzyme. D'Herelle contends that it is a living or ultra microscopic virus, parasitic on susceptible bacteria. Phages are highly specific, but have no effect on unrelated organisms. Phage is very active in vitro, one part of the filtrate being able to dissolve 1,000,000,000 parts of the susceptible culture.

Therapeutic: In the early inflammatory stage one can also use numerous remedies, such as cotton or gauze wicks dipped in phenol glycerine, ichthyol glycerine, Burrow's solution, hydrazol, and laudanum in warm olive oil. These solutions are most effective when warm. The insertion of the wick, dry or medicated, permits a continuous saturation of the inflamed parts, by dropping the solution on at regular intervals. Firm packing of the involved canal with dry wicks or tampons has been advised. This is a painful procedure and hardly merits the attempt. Several efforts to apply this method of treatment have resulted in such aggravation of the pain that the writer abandoned the procedure. Exposure to violet ray has been reported favorably by some writers, but I have had no experience with that treatment and, therefore, cannot comment on its efficacy.

Operative: If by these methods relief is not afforded and the furuncle has not ruptured spontaneously, there is only one

proper recourse left, *i. e.*, adequate incision and drainage should be instituted. Local anesthesia is usually futile. Ethylchloride, nitrous oxide, or ether inhalation produce the desirable effect. Deep anesthesia is not required. When the furuncle is superficial, the incision is made through the swelling only. But when it is deep, then the incision should go down to the perichondrium. At times it may be necessary to make multiple parallel, or spoke wheel incisions. Needless to say, this operation requires the usual aseptic surgical technique.

Several points can well be stressed here. Care should be taken not to incise too deeply when working on the posterior wall, as this forms the anterior boundary of the mastoid bone. Too deep an incision here may penetrate the mastoid cells. The facial nerve is located immediately below the articulation of the lower jaw, anterior to the cartilaginous meatus. Also the parotid gland lies in close proximity. These structures should be kept in mind constantly and care taken not to include them in the incision.

In infants the facial nerve is more exposed to danger, lying immediately below and internal to the attachment of the lobule; hence the greater danger of severing this nerve. Carelessness in the direction of the knife may sometimes cause the severance of the ligaments of the temporomaxillary joint and thus cause permanent facial disfigurement.

Postoperative: After the furuncle has been incised, thin dry cotton or gauze drains can be maintained in the canal and changed several times a day. This should be done gently so as not to macerate the mucosa. Tonics and restoratives are indicated. Sedatives or hypnotics before and after the operation are needed to control the pain. One can also employ graduated increasing doses of autogenous vaccines at this stage to raise the opsonic index. These vaccines or small doses of phage injection will tend to prevent recurrence of the lesion as well as lessen the intensity and duration of any recurrence.

CONCLUSIONS.

1. Furunculosis of the external auditory canal is to be differentiated from other conditions, the main ones being mastoiditis, aural polypi, perichondritis, exostoses, carious teeth and granulations.

2. Bacteriophage is of great value in the early stage to abort the developing furuncle.

3. Bacteriophage in these conditions is effective when applied directly on the tumefaction.

4. Bacteriophage injections, either in a remote part of the body or directly into the infected area, promotes rapid liquefaction and abortion of the infection.

5. Staphylococcus phage is much more effective than the streptococcus phage.

6. In 98 per cent of the cases treated in the early stages, bacteriophage treatment has relieved the condition promptly.

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426 FREUND: FURUNCULOSIS OF EXT. AUDITORY CANAL.

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CONNECTICUT STATE MEDICAL SOCIETY,
EYE, EAR, NOSE AND THROAT SECTION.

The Fourteenth Annual Meeting of the Eye, Ear, Nose and Throat Section of the Connecticut State Medical Society was held at Hartford, Conn., on Thursday, May 21.

Dr. Conrad Berens, of New York, spoke on "Clinical Considerations of Ocular Fatigue," and Dr. E. Ross Faulkner, of New York, gave a talk on "Review of Operative Technique in Nose and Throat Surgery."

The following officers were elected for the ensuing year: Dr. Walter L. Hogan, of Hartford, Conn., Chairman; Dr. Charles T. Flynn, of New Haven, Vice-Chairman; and Dr. Shirley Harold Baron, of New London, Secretary-Treasurer.

SIMPLE MASTOID OPERATION AND SOME FUNCTIONAL RESULTS.*†

DR. FRED W. GRAEF, New York.

The resulting hearing after a simple mastoid operation determines in a measure whether our efforts have been attended by success or partial failure. After a period of years, what is the amount of hearing loss sustained by an individual who has had a simple mastoid? A search of the literature yields many reports showing excellent functional results according to tests made by the use of the watch and conversational voice, which are excellent estimates of practical hearing. The audiometer does not appear to have been a popular instrument with the majority of writers.

Where permanent damage has been sustained, the cause has been attributed to many factors. McCarthy¹ says: "We feel that most of the cases which present a marked and persistent loss of hearing, following simple mastoid operation, are due to middle ear infection, setting up some change in the internal ear, provided, of course, there are no gross evidences that there has been intense destruction in the middle ear itself. There is no reason why careful, simple mastoid drainage should cause loss of hearing; in fact it should be considered a measure to safeguard the hearing. When harm is done, it is through the probing of the middle ear with stiff probes or in striking the ossicles with curettes or the like." This might be construed to mean trauma during the operation or after treatment or even toxic neuritis. Brown² claims that it is early operation which restores normal hearing, because here the inflammatory process has had little time in which to bring about irreparable damage to the delicate ear structure. He also cautions against unnecessary interference with the external auditory meatus. It would seem that he meant partial or complete collapse of the canal wall, thus

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interfering with the conductive mechanism. We, therefore, have two good reasons for auditory failure following operation. They are both mechanical in nature, which could and should be avoided. The information gained from frequent and persistent probing of the antrum is not sufficient to warrant the risk. The complete separation of the membranous from the bony canal wall, which courts a distorted external auditory meatus, is rarely necessary.

It is difficult to conceive an acute inflammatory process taking place in the middle ear cavity with no resulting impairment in the movement of the ossicular joints or a thickening of the lining membrane. This would lead one to expect that every acute otitis media is attended by some loss of function, however small; indeed, this may be what Kopetzky³ had in mind as indicated by the following quotation: "Summarizing the results of the simple mastoid operation upon hearing, it may be stated with confidence that after the operation and subsequent treatment the hearing will, in the usual run of cases, be found normal upon functional tests. In a small number, although the tests may show a slight reduction, the hearing is for all practical purposes normal."

The permanent condition of the middle ear and membrane tympani were the most important factors in the series of cases reported by Friedman and Greenfield.⁴ They found that if a mastoid is operated upon early, they expect practically normal hearing to return. Only occasionally did they find some slight impairment. In all their cases in whom the middle ear became dry, with complete resolution of the membrane, the hearing returned to its normal state. It is claimed, therefore, that the mastoid operation does not in any way prove detrimental to the auditory function. Permanent perforations are a constant menace to the patient because of the opportunity they afford to reinfect the tympanic cavity from without, besides which they connect up the Eustachian tube to the external auditory meatus. This we know invites reinfection from the nasopharynx. However, a perforation is frequently found when the auditory function is surprisingly good.

The Schwartze operation seems to be the technique adopted by the majority of men. There are no doubt some individual

variations, but the essential features are still largely adhered to. Boyd⁵ reports a 3.3 per cent failure of cure in acute uncomplicated cases using this method. Hewat,⁶ reporting a large series of cases operated on according to this technique gave an interesting summary of the functional results. He chose 99 cases and grouped them as follows:

Group A: Seventy-five cases were found to have perfect hearing. Group B: Ten cases, hearing in operated ear equal to hearing in other ear. Group C: Fourteen cases, hearing in operated ear worse than in other ear.

Causes of acute otitis media in these latter cases were: Influenza, six; scarlet fever, two; measles, four; bathing, one; and unknown, one. Duration of the ear trouble before operation averages 60 days and the time of healing 62 days. These excellent results were not dependent upon early operation or particularly speedy recovery.

Etiological factors of his Group C are well known to be the cause of our most unsatisfactory cases, yielding the highest percentage of complications and recurrences, together with the greatest functional loss. Ridout,⁷ in a recently published article, expresses the sentiments of this writer, which are excellently portrayed in his words. He says: "It is also difficult to imagine how an extensive osteomyelitis can satisfactorily drain through a small aperture, such as an aditus and the perforation in the membrana tympani. Added to this, the profuse flow of pus around a delicate structure, such as the chain of ossicles, with accompanying mucous swelling and pulsating congestion, if allowed to go on for more than a short period, must tend to cause permanent damage and a diminution of hearing." He is in accord with his coworker, Heath,⁸ who claims that with very few exceptions the damage done to the organ of hearing in acute suppurative disease is dependent directly on the duration. He does not state the nature of this resulting deafness but his writings would lead one to suppose that they are entirely conductive in character. My own observations tend to agree with these two writers except in those cases where the acute otitis is a complication of the acute infectious diseases of childhood. The hearing loss here is, I believe, a combined lesion, *i. e.*, a toxic neuritis and a conductive deafness. It has been my privilege to be

associated with one of the Department of Health Hospitals, where a great deal of scarlet fever and measles are cared for. Our operative cases run the usual postoperative course and practically all show a marked diminution in hearing. They invariably show signs of nerve deafness.

The public still retains a great fear of the mastoid operation, which I do not think statistics warrant. The vast majority of simple mastoid operations are well and carefully done. The mortality varies greatly. Cranston and Voss⁹ report 149 mastoidectomies with the mortality rate on none. Coates and his associates,¹⁰ 29 deaths out of 644, or a mortality of 4.5 per cent. Ridout⁷ has given one death from meningitis in 633 operations from 1928-1931. The largest group reported is that of Neumann.¹¹ He draws from 1300 operations, indicating that no deaths or complications occurred in 70 cases which underwent operation during the second and third week, but operation during the first week of the disease shows complications of 25 per cent and the mortality 8.3 per cent. He also feels that in the very acute, or so-called fulminating cases, operation during the first week is not as safe as some writers would have us believe. It is interesting to note that the complications and mortality rate are the same for cases which were operated upon during the first and sixth week of their acute otitis.

There are few, if any, major surgical procedures which can show a much lower mortality rate. Heath¹² likens acute mastoiditis to acute appendicitis and says: "This dangerous affection needs treatment of a certain kind at a certain stage in order to insure success." He compares aural suppuration to abdominal appendicitis, in that it is not advisable to wait abscess formation before surgical treatment is adopted. That the diseased walls of the suppurating antrum demands surgical intervention before and not after the irritating discharge given off from that cavity has led to such serious changes in the mechanical structure of the tympanic chamber that permanent deafness must result. This brilliant writer, nearly 20 years ago, in a plea for early operation, quoted hospital statistics showing a 12 per cent mortality and permanent deafness resulting in 90 per cent.

It is well known that it is the serious complications of the lateral sinus thrombosis, meningitis or brain abscess, which

raises the death rate. Mygind¹³ found that intracranial complication is rare in children under 5 years of age. After the fifth year this type of complication is four times as frequent; namely, 17 per cent. Incidentally, this is the same percentage as he finds in adults.

I am sure it is very rare for the present day otologist to lose a case of acute mastoiditis as a direct result of the operation itself. We have learned that the removal of the dural plate in the middle fossa and the bony covering of the lateral sinus is, as a rule, accompanied by no serious consequences. It would seem, therefore, that surgery is not dangerous and if it were possible to allay the fears of the average lay man there would be fewer refusals of this form of treatment.

Much has been said and written as to the selection of the proper time for operation. Neumann¹¹ and Barwell¹⁴ definitely favor that period between the second and fifth week because they feel that complications occur with alarming frequency before and after this period. The individual case will have to be treated as a distinct entity, but the majority will run a course so that surgical treatment may be instituted during this ideal time. We have all seen patient whose only complaint is partial loss of hearing in one ear. On carefully delving into their history, we learn that the other ear is without function as a hearing organ and has been so for many years, because at one time it ran the typical course of acute otitis media and after a long indefinite period became dry. At the present time the patient regards it as a useless organ. They are deeply concerned only with the remaining good ear and implore you to direct your best efforts to its preservation. It requires little stretch of the imagination to reconstruct the story of the permanently damaged ear. An acute otitis media in early life, accompanied by the usual annoying discharge, despite all conservative efforts to control it. Fortunately for this individual, after many months this ceased, leaving in its wake a residual chronic ear or a heavily scarred drum, in either case an organ of hearing damaged beyond repair. McKenzie¹⁵ has given a similar situation as a plea for early mastoidectomy, when he says: "If a patient seriously deaf in one ear falls a victim to acute otitis media, most of us will regard such a condition as a reason for early operation to save the hearing."

In large centres well supplied with clinics, it is a very common thing to find the younger patients being taken from one hospital to another in the hope that they will find someone to advise conservative treatment. The reason behind this is their unwarranted fear of a simple mastoid, which has, in all probability, been advised several times. It is my contention that a history of chronicity of over four weeks, other things being equal, should be sufficient grounds for refusing conservative treatment.

GROUP A—TABLE 1.
DURATION OF ACUTE OTITIS MEDIA BEFORE
OPERATION TWO WEEKS.

Case	Duration in Weeks	Per Cent Hearing Loss for Speech
No. 1	1	4.2
No. 2	2	12.
No. 3	2	12.9
No. 4	2	14.4
No. 5	1	14.6
No. 6	2	18.4
No. 7	2	18.4
No. 8	2	21.2
No. 9	2	22.4
No. 10	2	24.
No. 11	2	28.9
No. 12	2	17.2
No. 13	2	16.
No. 14	2	12.

Average hearing loss for speech 16.8 per cent.

In order to check up on the resulting hearing, a large number of case histories were reviewed, with the idea of selecting therefrom the ideal surgical results. We confined our cases to those which had been operated upon about five years. The age limit at the time of operation was approximately 12 years, the majority being younger. This was done purposely in order to eliminate the older patients, who might be affected by chronic catarrhal otitis or other ear diseases. These cases had no previous history of ear trouble and we thus ascertained that the acute otitis which went on to acute mastoiditis was their first attack. Only unilateral mastoids were selected. None had had trouble since they were officially discharged. In short, they were chosen because they were the ideal surgical results which might be termed cures and as such should have retained the maximum amount of hearing. At the time of

testing, the ear was dry and had remained so since operation. They had no complaint as to functional result or any discomfort.

The testing was done on a 2-A audiometer, testing both ears and plotting the graphs as usual. Percentage loss of hearing for speech was figured in the usual way, *i. e.*, the average of 512, 1024 and 2048 multiplied by 0.8.

The history of onset we used was given at the time of admission to the hospital. Duration of discharge dated from spontaneous rupture of the membrani tympani or myringotomy. They were divided into three groups as follows:

Group A: Duration of acute otitis media before operation two weeks. Group B: Duration of otitis media before operation four weeks. Group C: Duration of acute otitis media before operation six weeks.

About one-third of the cases were private, contributed by three different otologists; the remainder were taken from the records of the Manhattan Eye, Ear and Throat Hospital.

A resumé of the first group of cases (14), on which the simple mastoid operation was performed within the first two weeks, yields some interesting audiometer tests. They all show a loss of function which varies from 4.2 per cent to 28.9 per cent, giving an average of about 16.8 per cent. None of our cases showed the operative ear equal to the other ear.

None had perfect hearing and only one showed less than a 12 per cent loss. Our findings do not compare with Hewat's,⁹ whose functional findings have been mentioned above.

A second group, Group B, in which the operative procedure occurred during the third and fourth week, show only a slight increase in loss, namely, 1 per cent. An equal number of cases shows an average of 17.8 per cent. This is, to me, a rather surprising finding, giving cause for reflection as to the optimum time for surgery. As stated before, the early operation is not without considerable risk and the delay into the third and fourth week increases the hearing loss so slightly as to be almost negligible. It has been found that complications are infrequent in this period, consequently the mortality should be equally low. It would, therefore, seem to be the

ideal surgical period, should no other factors arise to influence our judgment.

GROUP B—TABLE 2.
DURATION OF ACUTE OTITIS MEDIA BEFORE
OPERATION FOUR WEEKS.

Case	Duration in Weeks	Per Cent Hearing Loss for Speech
No. 1	4	10.6
No. 2	4	12.
No. 3	4	12.
No. 4	4	16.
No. 5	4	17.2
No. 6	4	18.6
No. 7	4	20.
No. 8	4	20.
No. 9	4	24.8
No. 10	4	24.9
No. 11	4	32.9
No. 12	4	10.6
No. 13	4	17.2
No. 14	4	13.2

Average hearing loss for speech 17.8 per cent.

The third group, in which the acute otitis continued until the sixth week, shows an average percentage loss of 19.4 per cent, which is slightly higher. The noticeable difference in these audiograms was their greater loss for upper tones. They also showed slightly increased loss in the lower register.

GROUP C—TABLE 3.
DURATION OF ACUTE OTITIS MEDIA BEFORE
OPERATION SIX WEEKS.

Case	Duration in Weeks	Per Cent Hearing Loss for Speech
No. 1	6	8.
No. 2	6	12.
No. 3	6	13.3
No. 4	6	16.
No. 5	6	16.
No. 6	6	22.4
No. 7	6	22.6
No. 8	7	22.6
No. 9	6	24.
No. 10	6	38.6

Average hearing loss for speech 19.5 per cent.

Insofar as the cases from which these findings have been taken were approximately five years postoperative, their hear-

ing deficiency may be assumed to be permanent. The variation of hearing loss between the three groups is very small, so that any resulting deafness is not directly proportional to the duration of the discharging ear. It would seem that the damage is done quite early, that it is conductive in character, with possibly secondary nerve involvement.

The amount of function which the simple mastoid operation preserves when done early is probably overestimated; rather, it would seem that a time should be chosen when complications are least likely to occur, and this appears to be in the third or fourth week. The course of the disease in any given case varies greatly and the unusual conditions will always have to be met with when they arise.

I wish to express my appreciation to Dr. Daniel Cuning, Dr. Joseph Kelly and Dr. Marvin Jones for many valuable suggestions and access to their private cases and using the findings.

CONCLUSIONS.

1. There is a loss of auditory function in most cases where simple mastoid is performed. This loss is variable in amount and is permanent.
2. The hearing loss increases but slightly between the second and sixth week of the acute otitis media.
3. The third and fourth week of acute otitis media seems to be the ideal time for surgical treatment.

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GRADENIGO'S SYNDROME SIMULATING EXPANDING INTRACRANIAL LESION.*†

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Transient involvement of some of the cranial nerves, particularly of the VIth and VIIth, in the course of middle ear and mastoid suppuration was known to many older observers. It was Gradenigo, however, who in 1904 assembled and analyzed a large number of cases describing the symptom complex to which his name is now attached, the so-called Gradenigo's syndrome. In the typical case, the syndrome is characterized by pain radiating along the distribution of the Vth nerve, pain about the eye as well as in the temporoparietal region, accompanied by paralysis (varying in degree) of the VIth nerve. All of these signs and symptoms, of course, occur on the side of the diseased ear and are believed to be due to an extension of the middle ear suppuration into the petrous portion of the temporal bone (petrositis). In the rare instance the oculomotor nerve may also become involved, and the diagnosis becomes somewhat obscured. The latter becomes still more uncertain when the syndrome develops at the end of a period of uncomplicated convalescence following a simple mastoidectomy and is associated with signs of increased intracranial tension such as intense headache, vomiting, and changes in the optic discs. Brain abscess is then apt to be suspected and all clinical resources must be utilized to exclude such a condition and save the patient from unnecessary and hazardous exploration of the intracranial contents.

CASE REPORT.

History: The patient, H. R., male, age 52 years, mildly diabetic, was first admitted to the Mt. Sinai Hospital on Feb. 4, 1935, complaining of pain in the left ear of five weeks' duration, following an upper respiratory infection. Ten days

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†From the Otological Service of the Mt. Sinai Hospital, New York.

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prior to this admission there had occurred spontaneous perforation of the ear drum with free discharge of pus. During the last three days he had suffered from severe left fronto-temporal headaches and dizziness.

Course on First Admission: Examination revealed signs of an acute, uncomplicated mastoiditis on the left side. This diagnosis was further supported by the report of the X-ray examination, which read as follows: "Right mastoid: The cells are small and clear. The pneumatic area extends a moderate distance posterior to the lateral sinus. Left mastoid: There is a diffuse haziness of the entire mastoid process with partial absorption of the intercellular septa, particularly over the perisinus and zygomatic regions. There is a prominence of the emissary vein on this side. One gets the impression of a diffuse slight haziness of the left petrous apex."

A simple mastoidectomy was then performed. Pus was found throughout the mastoid and particularly in the cells overlying the middle fossa dura and the lateral sinus. The latter was found exposed by disease, thickened and covered with granulations. The middle fossa dura was also exposed about 1 cm. over the antrum. Low down in the initial groove between the horizontal portion of the sigmoid sinus and the facial nerve a deep pit was encountered, extending for at least an inch into the petrous pyramid. This contained frank pus which welled up when the pit was opened. Culture of the pus revealed pneumococcus Type III. Four days after the operation the patient complained of severe left-sided headache. A transient horizontal nystagmus, most marked to the left, was noted. Three days later a neurological examination showed, in addition, irregular pupils, the left smaller than the right, and diminished reaction to light on both sides. During the next three weeks the headache subsided and the patient was discharged to the Out-Patient Department for dressing and further observation.

He felt well during the next three weeks so that by the end of this period (seven weeks after operation) the mastoid wound was allowed to close. Shortly afterward, however, frontal and left temporoparietal headaches recurred with increasing severity so that on May 14, 1935, after three days of persistent, intolerable headache, he was readmitted to the hospital.

Second Admission: The left middle ear was found to be dry. All landmarks were present and the postauricular wound was closed. There was no tenderness of the bone anywhere. There was a coarse, horizontal nystagmus, most marked toward the left. The pupils were equal and regular, fixed to light, but reacted in accommodation. There was evidence of chronic ethmoid and maxillary sinusitis. A lumbar puncture revealed normal cerebrospinal fluid.

Because of the persistent headache and the apparent absence of otogenic disease, he was transferred to the Neurological Service two weeks after readmission. There drooping of the left eyelid was noted, which at the end of the next two weeks developed into a complete oculomotor paralysis on the left side. This was accompanied by supranuclear facial weakness and a positive Babinski sign on the right side. A history of venereal disease was obtained, and in view of the pupillary changes, although serological tests were negative, antiluetic therapy in the form of bismol injections was begun. His headaches, however, became more severe and were followed by pain in the eyes. Examination of the eye grounds revealed that the nerve heads were yellowish in color and almost waxy in texture. The margins were indistinct in the region of the blood vessels and were blurred slightly at 5 o'clock. In the right fundus, nasally, a minute hemorrhage was seen about two diopters distance away and a hemorrhage and an exudate were seen below and nasally along the vessels. Two hemorrhages were also seen in the periphery of the left disc. One week later the fundi showed some improvement, but the patient developed ptosis of the left lid, which increased rapidly, as did the internal rectus paresis.

At this time the possibility of an expanding intracranial lesion was seriously considered. Two diagnostic tests were contemplated: *a.* The injection of sodium iodide solution into the common carotid artery to outline a probable aneurysm; *b.* The injection of air into the ventricular system (ventriculography) to locate or exclude a brain abscess. The patient's condition was rather poor and either one of the procedures was considered a risk not fully justified in the opinion of some of the observers. While these diagnostic steps were being considered, the patient suddenly displayed new clinical signs. His left ear began to discharge thick pus; his temperature, which up to now had been normal, rose to 103.4° F., and signs

of meningeal irritation appeared. Revision of the surgical field was considered necessary and he was returned to the Otological Service.

The exploration was preceded by a ventricular puncture in order to obtain a better exposure of the region. No frank disease of the petrous pyramid was noted. A rubber dam was inserted between the brain and the superior surface of the petrous bone, and the wound was partially closed. Following the operation the patient reacted poorly for 12 hours. He was given a continuous intravenous injection of 5 per cent glucose in saline. He then began to improve slowly but progressively, though at first there was noted an external rectus palsy on the left side. During the next two weeks the IIIrd and VIth nerves regained their function gradually, and his headaches disappeared. One month after the operation he was free of signs and symptoms and was discharged to the Out-Patient Department for dressing and observation.

COMMENT.

Gradenigo's syndrome is usually associated with an acute infection, particularly if the latter is complicated by mastoiditis. Most frequently it is noted during the preoperative stage but occasionally, as in this case, it presents itself as a post-operative complication.

The earliest manifestations of this syndrome are headache, pain in the distribution of the trigeminal nerve, diplopia and peripheral facial paresis. In rare instances oculomotor palsy and optic neuritis or papilloedema may also develop. Thus, the cranial nerves which are most commonly affected are the VIth, Vth, VIIth, and those less commonly involved are the IIIrd and IInd. All or any of these nerves may be affected directly or indirectly by intracranial extension of the suppurative disease of the temporal bone. The lesion affecting the nerve or nerves may be in the nature of a transient local congestion of neighboring tissue or localized inflammation of the dura with or without a localized abscess formation. Diffuse serous meningitis has often been considered as a probable cause. A fatal suppurative meningitis is perhaps the most frequent direct cause of such involvement.

Among the more rare features in the case described here were the involvement of the oculomotor nerve, the changes in

the fundi, the appearance of pyramidal tract signs and the occurrence of the entire syndrome following a period of what appeared to be satisfactory and uninterrupted convalescence. However, it has already been pointed out that oculomotor nerve palsy, although not frequent, is not a rare occurrence in Gradenigo's syndrome. The cause of the involvement of the oculomotor nerve can be readily understood when the relationship of the nerve to the petrous pyramid is recalled. The

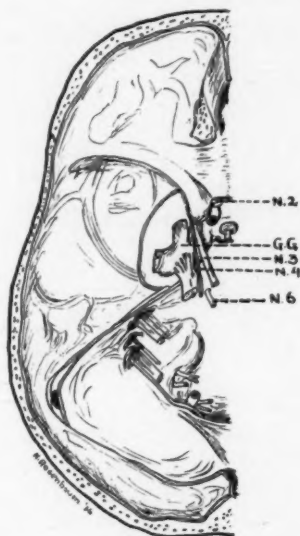


Fig. 1. Drawing showing relationship of cranial nerves involved in Gradenigo's syndrome. Note the proximity of the oculomotor nerve (N3), abducens nerve (N6) and the Gasserian ganglion (GG). (After Kopsch.)

oculomotor nerve has its superficial origin on the middle aspect of the ipsilateral cerebral peduncle. It pierces the dura in the middle cranial fossa and enters the lateral wall of the homolateral cavernous sinus. Shortly before it enters the sinus it is in close contact with the petrous pyramid, the site of the assumed disease process. At this point it also neighbors upon the Gasserian ganglion, the abducens nerve and the cerebral peduncle (see Figs. 1 and 2). The close relationship of the above structures at this point readily explains the concomitant involvement of the Vth, branches of the Vth

nerve or that of the Gasserian ganglion with extension to the homolateral peduncles, giving rise, as in this case, to pyramidal tract signs.

Of the cranial nerves the abducens is the most frequently involved in Gradenigo's syndrome. Such an occurrence is readily understood when the course and relationship of the nerve are reviewed. The VIth nerve has its superficial origin at

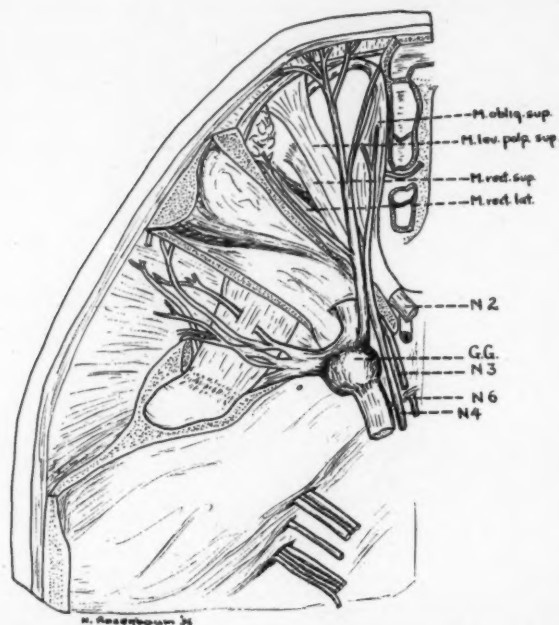


Fig. 2. Drawing illustrating the proximity of the Gasserian ganglion (GG), oculomotor nerve (N3) and abducens nerve (N6) to the apex of the petrous portion of the temporal bone. (After Kopsch.)

the inferior border of the pons. Reaching the upper border of the petrous portion of the temporal bone, it pierces the dura. Then passing beneath the petrosphenoidal ligament, it also enters the cavernous sinus. For a distance of several millimeters the VIth nerve is in direct contact with the petrous portion of the temporal bone. At the apical point of this bone, adjacent to a portion of the mesial wall of the sphenoid, it passes through the so-called Dorello's canal. Any lesion

provoking increased pressure within this canal is likely to implicate the enclosed Vth nerve.

The manifestations of involvement of the trigeminal nerve are mainly in the nature of pain in the distribution of that nerve. Here also the close relationship of the Gasserian ganglion to the petrous bone is most likely responsible for this fairly constant symptom in Gradenigo's syndrome.

Retinal changes, such as early papilloedema, occasional retinal hemorrhage when found, as in our case, in association with Gradenigo's syndrome are difficult to interpret. It is known, however, that choked discs may be associated with mastoid disease, particularly in the presence of thrombosis of the lateral sinus. Choked discs are encountered in about 19 per cent of the cases of lateral sinus thrombosis. The occurrence of choked discs in such instances was explained by Barker in the following manner: He suggested the probability that lymphatics leaving the skull by the carotid foramen may have become inflamed by extension of disease from the tympanic cavity. The contributing channels which accompany the several branches of the internal carotid artery include also that which accompanies the ophthalmic artery. The extension of the inflammation to the lymphatic trunks, causing their obliteration, might retard the course of the fluid through some lymphatic channels in the optic nerve, or the inflammation of the lymphatic trunks might extend backward to the lymph spaces about the ophthalmic artery and so produce engorgement of the lymphatics and venous circulation of the fundus oculi. In another explanation advanced by him to explain the papilloedema, it is assumed that damage to the carotid plexus of the sympathetic, caused by intradural inflammation, might produce vasomotor disturbances in the optic nerve and thus cause changes in the fundus without there being a concurrent brain disease.

The occurrence of facial paralysis is most frequent in chronic otitis media. It is less frequently encountered in acute disease of the mastoid. In either instance the paralysis which is always homolateral with the diseased ear is of the peripheral type, involving all the three branches of the affected VIIth nerve. The character of the facial palsy in this case, however, was of the supranuclear variety and had involved only the lower two-thirds of the face and that on the side oppo-

site to the diseased ear. It was also homolateral with the pyramidal tract signs, indicating that the causative lesion was at a point where the aberrant pyramidal fibers to the VIIth nerve were running alongside of the pyramidal tract fibers. A lesion close to a cerebral peduncle may involve both the aberrant pyramidal fibers to the nucleus of the VIIth nerve and the pyramidal tracts above the decussation. At this point the homolateral IIIrd nerve may easily become implicated. Thus, concomitant occurrence of oculomotor palsy and contralateral pyramidal tract signs, the so-called Bene-

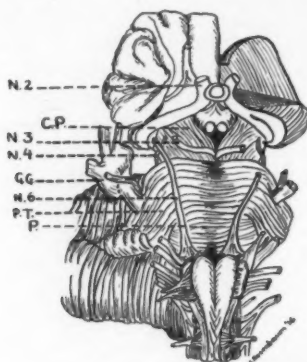


Fig. 3. The base of the brain showing the proximity of structures involved in Gradenigo's syndrome, such as the abducens nerve (N6), oculomotor nerve (N3) and Gasserian ganglion (GG), to the ipsilateral pyramidal tract running within the cerebral peduncle (CP) and pons (P). This explains the ipsilateral manifestation of involvement of the Vth, IIIrd and trigeminal nerves with contralateral manifestations of pyramidal tract involvement. (After Kopsch.)

dikt's syndrome of alternating oculomotor paralysis, adds further support to the postulated location of the lesion (see Fig. 3).

SUMMARY AND CONCLUSIONS.

The outstanding features in the case are as follows: 1. A mildly diabetic patient developed signs of mastoiditis in the wake of a suppurative middle ear disease. 2. Mastoidectomy disclosed an extensively broken down mastoid with a deep pit extending into the petrous pyramid. 3. Cultures of pus obtained from the mastoid grew out pneumococcus Type III, an organism notorious for giving rise to delayed complications. 4. Healing proceeded uneventfully for four months when

signs of an intracranial involvement suddenly appeared, a condition not uncommon in pneumococcus Type III infection. 5. There developed headache, vomiting, left-sided oculomotor paralysis with contralateral pyramidal tract signs and symptoms which pointed to a probable diagnosis of an expanding intracranial lesion, brain abscess or aneurysm. Diagnostic tests of a rather formidable character were contemplated but abandoned; then suddenly a free discharge from the left middle ear appeared and pointed to a relighting of the petrositis. Exploration did not reveal any visible pathologic changes, but after a short unfavorable period, convalescence began and the signs and symptoms of intracranial involvement disappeared.

It seems reasonable to assume that the clinical picture in the case above reported was due to a petrositis and a related localized leptomeningitis and that although no visible pathologic change was found on re-exploration of the mastoid, the operation must have opened a sealed-off pocket of suppuration or necrosis. Channels for more thorough drainage were established and thereby not only arrested further progress of intracranial involvement but permitted restitution of normal function of the affected cranial nerves.

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EXTERNAL RADICAL FRONTAL SINUS OPERATION WITH RETENTION OF THE ORIGINAL OSTEUM FRONTALE.

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The average ear, nose and throat specialist has only two absolute indications for radical sinus operation: 1. Threatened intracranial complications or the actual appearance of these complications; 2. Orbital complications with fistula formation. This latter complication will be discussed here.

If during the course of an acute frontal sinusitis, orbital complications occur, as manifested by chemosis, swelling, fluctuation or periosteal abscess, most surgeons are satisfied with incision and drainage; they try to avoid any surgical procedure involving injuries to the bone.

The prognosis is always grave, but the fatalities in acute sinusitis treated by radical operation are much higher than in those treated by conservative methods.

The explanation of better results in conservative procedures is that in the onset of acute sinusitis, the human organism has not had time to build up a local defense mechanism adequate to produce immunity; the patient must combat the original etiologic factor, *i. e.*, influenza, scarlatina, morbilli, common cold, etc., and in addition, toxemia produced by the retention of pus.

The incision evacuating the pus eliminates part of the toxic material, helping the patient in overcoming the original systemic disease. After simple incision and drainage the process may completely heal, but more often a discharging fistula remains.

The fistula is usually due to occlusion of the drainage passages, caused by bony obstruction, polypoid growths, or simple swelling of the mucous membrane caused by an acute

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infection. The obstruction is usually incomplete; some pus always escapes through the nasofrontal duct but not enough to completely relieve retention symptoms.

The fistula is often complicated with caries and various degrees of necrosis of the bony walls; a small area of the mucous membrane, either from pressure or due to virulence of infective organism, becomes necrotic, producing thrombophlebitis of the small veins that penetrate the bone.

The infection is thus carried to the external periosteum of the sinus wall, setting up a purulent periostitis, thereby impairing nourishment to the bone and producing softening and a breaking down of the tissues in this circumscribed area.

The extent of the area of necrosis depends upon pressure and the virulence of the causative organism and may range in size from that of a large needle to a considerable area of the sinus wall.

Once a fistula has occurred the sinusitis may heal without operation, but usually there is recurrence of abscess and the breaking through of another fistula with ugly scarring of eyelids.

The fistula and scars are very unsightly and the concomitant necrosis is an ever present hazard. A fistula is, therefore, considered an absolute indication for external radical operation.

If radical operation is decided upon, our selection must be one with the least probability of recurrence and good cosmetic effect.

The Killian operation with modifications as herein described fills the requirements, except in those cases where the entire wall anteriorly is necrotic and where the building of a bony bridge is, of course, impossible.

Necrosis of a small part of the bridge does not produce disfiguration, providing the remaining periosteum of the bridge is not destroyed.

In those cases of radical frontal sinus operation wherein the ingrowing tissues of the orbita completely obliterate the sinus cavity, the most perfect healing occurs. For this reason the Reidel operation usually gives very good results, but the cosmetic effects are bad, as extremely repellent disfiguration sometimes occurs.

After the Killian operation there is usually obliteration of lateral part of the frontal sinus since the cavity is shallow there. The obliteration of the deep medial part, near the osteum frontale and the nasofrontal duct, often is imperfect. The result is a small cavity which, on account of inadequate drainage, continues to suppurate.

In performing the typical Killian operation the osteum frontale is destroyed and a new nasofrontal duct is formed. This new duct, consisting of scar-forming connective tissues, often loses its permeability and requires prolonged postoperative treatment, constant cauterization, and prolonged courses of dilatation. In some cases even these procedures are of no avail; the sinus breaks down repeatedly, and a new fistula forms.

The reason for these recurrent breakdowns is the lack of bony base and healthy mucous membrane in the new duct, because of scar tissue formation, which has a tendency to retract. The attempt to line the new duct with a flap of mucous membrane or periosteum is difficult and the results dubious; therefore, the plan of the Killian operation is modified to have a duct, which connects the newly formed small sinus cavity with the nose by a canal with a solid bony base and intact mucous membrane.

We achieved this purpose by maintaining the osteum frontale and eventually part of the original nasofrontal duct.

After operation, pus is carried into the nose through the canal as formed in the original Killian operation. This remains permeable for a short time and satisfactorily acts in eliminating the irritation and pressure of the pus, giving opportunity for some recuperation and shrinkage of mucous membrane of the original nasofrontal duct to normalcy.

The original and now permeable nasofrontal duct is always capable of conducting the relatively small amount of pus originating from the remaining small sinus.

The results with this method were uniformly good, only one of our cases showing evidence of breakdown 15 days after operation; even in this case discharge persisted only for a short time with no recurrence.

In not a single case were there any complications after the operation, and no intranasal treatment whatever was necessary after operation.

Before proceeding with radical operation, we always explore nose for polyps, deviations, or other obstructions, and correct them, so that healing will not be impaired.

Good X-ray pictures indicate condition of the maxillary and ethmoidal sinuses, as well as the extent, form and location of fistula in the bone.

Hematology is very important in differential diagnosis and complications. High white cell count with excess of polymorphonuclears helps to rule out these.

Avoid operation in the presence of an acute disease.

As a rule we use Flagg's intratracheal anesthesia, which is not difficult to one accustomed to doing bronchoscopy. This gives a quiet, uniform, superficial anesthesia and lessens the danger of pulmonic complications. The nose should be packed with adrenalin tampons and the operation done in the semi-sitting position.

Start the incision at the supraorbital notch, going through the eyebrow and continue down on the side of the nose. Incise soft tissues on side of the nose to the bone. On the frontal part of the incision soft parts are carefully separated only to the periosteum. We leave the periosteum intact, pushing the soft tissues upward and downward, exposing about 2 cm. of periosteum free from all coverings. Now we incise the periosteum 1 cm. higher than the supraorbital ridge and running parallel to it. The anterior wall of the sinus is exposed by pushing the soft tissues upward.

At this stage of the operation it is advisable to conduct a blunt probe through the fistula into the cavity and ascertain the extent of the frontal sinus. The probing must be very carefully done, on account of possibility of destroyed bony wall and injury to the brain.

The bridge is now formed. We start with a V chisel, beginning with the most lateral part of the sinus as ascertained by probing and X-rays.

We begin laterally superficially and, as we continue in the medial direction, we deepen the canal with the V chisel more and more until the frontal wall is perforated. Under continuous control of a probe we remove that part of the anterior wall which lies above the bridge. The bony bridge is formed in such a way as to be at least .5 to .75 cm. broad.

The part near the fistula is often necrotic and requires removal, but care must be taken not to destroy the entire bridge. A small area of necrosis in the bridge does not unduly influence the cosmetic result.

Now we carefully explore the mucous membrane of the sinus and probe the nasofrontal duct, which is patulous enough in adults if it permits a No. 2 Sullivan probe. We have been able to insert easily in all our cases.

For purposes of assured orientation we leave a probe in the osteum frontale and proceed very carefully in removing the mucous membrane and necrotic bone by means of curette from the sinus.

Remove bone from posterior wall only if absolutely necessary, because intracranial complications are much more common after exposing the dura in radical frontal sinus operation than in mastoid operation.

The periosteum of the lower border of the bridge is now incised and the periosteum of the orbit is elevated carefully to avoid injury to the trochlea or lacrymal sac.

The next step is removal of the upper part of the nasal process of the maxilla. The best instrument for this purpose is the V chisel. The mucous membrane is incised and the opening into the nose is made.

The lamina papyracea, processus uncinatum, bulla ethmoidalis and anterior ethmoid cells are now removed with rongeur and curette, but we do not touch the posterior ethmoid cells unless absolutely necessary.

The next step is removal of the base of the cavity, protecting the osteum frontale and its mucous membrane by introducing probe into it. We get the best results in those cases where the upper part of the duct and osteum frontale remain intact.

The sinus is now filled with gauze impregnated with vaseline. One end of gauze is carried through the new opening into the nose.

The skin is united by silkworm sutures and a small drain is inserted into the medial angle of the wound.

The drain is removed after 48 hours; sutures on the fifth day. No intranasal treatment was necessary in any of our cases.

A few of our cases in which the above described technique was used are described herewith:

Case 1: J. W., age 17 years, illness commenced Jan. 5, 1934, with grippe, severe cold in the head; temperature 100-103°, and chilly sensations.

Jan. 15, 1934, the left eyelid commenced to swell very rapidly. Came to clinic, admitted as ward patient at St. Mary's Hospital.

Findings: Fairly well developed but undernourished female, very ill, soporous and constantly moaning. Left eye opened with difficulty, large swelling of upper eyelid, lateral part of swelling fluctuates slight chemosis, visus 5/5.

Both nostrils swollen, red, tender; mucous membrane of nose red, edematous and both nares full of pus. After cleansing of interior of nose there was a continuous flow of grayish-white pus from below the anterior part of the middle turbinate.

X-rays: Very dark left frontal sinus and some darkening of the left anterior ethmoids.

Blood Count: Leukocytes, 15,000; polys., 80 per cent; R.B.C., 4,100,000; hemoglobin, 80 per cent.

Urine: Some albumin. No casts.

Physical Examination: Diffuse rales, loud breath sounds, heart clear, borders O. K., pulse rhythmic, soft 112, temperature 104°.

Diagnosis: Acute rhinitis, acute bronchitis, acute left-sided sinusitis frontalis and ethmoiditis, periosteal abscess.

Incision released large amount of pus and probe indicated a bony fistula into the sinus.

After the incision and drainage, patient immediately improved, temperature dropped to normal, and signs of acute rhinitis and bronchitis as well as concomitant toxemia cleared.

Jan. 30, 1934, temperature 99.6°, pulse 88, general health good. There was a continuous discharge of yellow pus from below the anterior end of the middle turbinate. The external fistula was very small, discharge was barely visible.

Feb. 3: Fistula closed, patient discharged.

Feb. 17: The medial portion of left eyelid markedly swollen and fluctuating. There was copious discharge from the nasofrontal duct. The reopening of the periosteal abscess discharges large amounts of pus. The anterior portion of middle turbinate, bulla ethmoidalis, the processus uncinatum and anterior ethmoidal cells were removed and a sound introduced. The lavaging fluid, consisting of physiological salt solution, returned mixed with large amount of pus. None of this fluid came through the fistula.

Feb. 27: Continued daily washing of sinus through nose.

March 18: Fistula closed, but discharge continued from the nasofrontal duct.

April 10: Entire process recurs. This time after considerable tumefaction the fistula opened spontaneously and discharge began again.

June 14: Patient readmitted to St. Mary's Hospital with a history of continuous discharge from the fistula.

Findings, old retracted scar on lateral portion upper left eyelid, discharging fistula on medial side of same upper left eyelid. On introducing probe through fistula, it slipped easily into frontal sinus.

X-rays show a very cloudy left sinus, its outer limits extending to the lateral third of the supraorbital ridge. There was some cloudiness of the left anterior ethmoidal cells.

Blood Picture: Leukocytes, 10,000; polymorphonuclears, 79 per cent; red blood corpuscles, 3,800,000; and hemoglobin, 70 per cent.

Urine showed no pathological changes.

Diagnosis: Chronic frontal sinusitis with fistula.

The operation was performed as above described. The middle of the bridge was necrotic, but the medial and lateral portions remained intact. The osteum frontale was readily permeable, admitting a No. 3 probe. The lower part of the intersinus septum was necrotic, lying loose and came out on removal of granulations.

The sinus was full of thick yellow pus, the membrane grayish and dirty, with exuberant granulations on lower part of the septum. With reflected light, part of the right frontal sinus could be studied. There was no evidence of pus and the mucous membrane was smooth.

This case is typical, of course, etiology, operation and post-operative treatment in sinus frontalis with fistula.

Origin: Rhinitis with infection spreading by continuity into the sinus, producing sinusitis with bony necrosis and fistula formation.

The fistula dried temporarily, only to again reopen after a varying interval, with repetition of the process until a radical operation was resorted to.

Intranasal removal of anterior end of the middle turbinate with irrigation was not effective.

After radical operation with conservation of osteum frontale, there was no recurrence of swelling or fistula formation, and no form of intranasal treatment was required. The intranasal discharge entirely cleared.

It is interesting to note there was no involvement of the right sinus, after removal of the necrotic intersinus septum. We had opportunity to observe like results in two other cases in which the intersinus septum was partly removed during the operation. Evidently during the half-year's course of this patient's illness, an adequate defense mechanism was built up against the invading bacteria, sufficient to protect the right sinus against infection. This mechanism was also effective in aerizing and draining the left sinus.

Case 2: M. L., male, age 20 years. Illness started with cold, rhinitis and cough. Fourteen days later swelling of right frontal region and right eyelid. Incised and large amount of pus drained. The wound continued to discharge for two months, then was quiescent for two weeks, followed by recurrent exacerbations and drainage for a period of six months, during which time the patient was never free from symptoms and discomfort, such as dull headache, fever and chilly feelings.

X-ray showed very cloudy right frontal sinus with small amount of destruction of supraorbital ridge. Ethmoids clear except right anterior cells, which were a little darker than the left ones.

Blood Picture: Leukocytes, 9,000; polys., 75 per cent; red blood corpuscles, 4,100,000; hemoglobin, 75 per cent. Urine, negative.

Findings: Right upper eyelid showed three distinct scars, upper lid markedly swollen and edematous but no fluctuation.

Nasal mucous membrane showed chronic irritation; the anterior portion of middle right turbinate glistened with discharge of tenacious pus coming from below it, deviation of septum at lower portion to the right.

Procedure: First intranasal operation repaired and corrected the deviation and resected the anterior portion of the middle turbinate. A canula was introduced and sinus washed daily, but no improvement shown.

March 25, 1930, radical operation performed. The nasofrontal duct was found permeable, permitting easy introduction of No. 3 probe.

On removing the base of the sinus the posterior lip of the osteum frontale broke and the mucous membrane was traumatized. The anterior part of the bony osteum and its mucous membrane remained intact. After treatment was uneventful; no form of intranasal medication or surgery was required.

The interesting feature of this case was that the posterior lip of the osteum frontale broke, but the permeability of the nasofrontal duct was not impaired and remained intact.

Case 3: July 22, 1930. M. S., well developed, well nourished female, was admitted to Municipal Contagious Disease Hospital, Passaic, with scarlet fever, extensive rash, prolonged hyperpyrexia with development of severe throat infection two weeks later, which was manifested by pseudodiphtheritic membrane on tonsils, palate and uvula.

Bacteriologic examination showed numerous streptococci and some staphylococci but no diphtheria bacilli.

Palpation revealed greatly enlarged submaxillary glands.

Aug. 3: Temperature rose to 104° in spite of retrogressing throat infection; slight systolic murmur. Anterior surface of left tibia showed a very tender swelling, which made rapid progress.

Aug. 4: Temperature between $100-104^{\circ}$. The upper left eyelid was swollen and tender, swelling on lower lid less marked; no visible pus on nasal mucous membrane; no other signs of inflammation in nose.

X-rays: Negative.

Aug. 6: Swelling of tibia fluctuating, large amount of pus evacuated on incision; probe going through incision to anterior bony surface of tibia.

Aug. 7: Marked chemosis of left conjunctiva, both eyelids markedly swollen, distinct fluctuation on the lateral portion of the upper eyelid. On incision a teaspoonful of grayish yellow pus was obtained. Introduction of probe through this opening it contacted with denuded bone of the orbital surface of the sinus. The periosteum was elevated by pus from the bone, but no evidence of fistula leading into the sinus could be found. The wound discharged pus for a period of 14 days, when it closed. On the following day examination of nose showed no evidence of sinus involvement.

Aug. 25: Evidence of new swelling on the medial surface of same eyelid. This was followed by a rise in temperature for 48 hours, at which time pus could be seen in the nose, coming from below anterior end of the left middle turbinate. Temperature was septic in character, $99.6-103^{\circ}$ with severe chills and excruciating headache. The anterior sinus wall was very tender.

X-ray showed left frontal sinus much darker than right sinus.

Aug. 26: Swelling again fluctuated, incised and sounded, probe slipped easily through bony fistula into the frontal sinus.

Nov. 5: We saw patient for first time.

Examination of nose showed constant flow of whitish-yellow pus from below anterior part of the middle turbinate, which was markedly swollen and red. In the left introitus and vestibulum nasi there was marked eczema present. There was a small retracted scar which was dry near the external canthus of the left eyelid and a fistula in the centre of another scar, located on the medial part of the same eyelid. Through this latter fistula our probe easily penetrated into the frontal sinus. On the anterior surface of the left leg over tibia there was a scar two inches long, adherent to the bone.

X-rays revealed a very cloudy left frontal sinus, but the maxillary sinus ethmoids were clear. Some destruction of medial portion of the supraorbital ridge was plainly evident. The heart was not enlarged, was rhythmic 80 with systolic murmur elicited at apex.

Urine: Small trace albumin with some hyaline and granular casts.

Blood Picture: White blood corpuscles, 11,000; polynuclear leukocytes, 80 per cent; hemoglobin, 60 per cent; red blood corpuscles, 3,900,000.

Girl operated on.

Findings: A large portion of the orbital surface of the sinus was necrotic and fell out, without any maneuvering after elevation of the orbital periosteum. In forming the bridge we found the bony medial third destroyed and replaced by granulations; the lateral two-thirds were solid. The sinus was full of pus; the mucous membrane thick, discolored and edematous. The osteum frontale and nasofrontal duct were permeable, permitting a No. 2 probe to slip in easily.

The cosmetic result was perfect. At the age of 19, very close inspection shows a thin white line indicating the point of incision. The destruction of the medial portion of the bridge did not have a deleterious effect as proven by no evidence of disfigurement.

The etiologic factor in this sinus disease is interesting, as the greatest portion of sinus infections originates from rhinitis, and the sinusitis is a complication.

In this case the nose had been carefully examined daily. There was no evidence of eczema swelling, discharge, or even redness, prior to Aug. 25, *i. e.*, three weeks after first swelling appeared on the eyelid. Repeated X-rays of left frontal sinus were taken prior to Aug. 25. The first periosteal abscess of the frontal bone became evident at the same time as the periosteal abscess on the left tibia. The temperature was septic 99.4-104° with several chills, and evident endocarditis, as shown by systolic murmur at cardiac apex.

Urine showed albumin and presence of granular casts.

Case 4: Boy, age 13 years, entered at St. Mary's Hospital Dec. 22, 1930, with history of head cold of four weeks' duration, edema of right eye for past two weeks, copious discharge from right nostril and occasional severe headaches which started in early morning hours and ceased at about 10 A. M. The swelling was intermittent in character. Patient was treated expectantly with adrenalin, ephedrin sprays and ice bag. Temperature ranged between 101-104°.

Examination revealed continuous discharge of pus from both nares, more marked on the right side; marked edematous swelling of right frontal area and involving the right upper lid.

Skiascopy: Both frontal areas dark.

X-ray Diagnosis: Acute frontal sinusitis and ethmoiditis both sides.

Treatment: Conservative expectant.

Temperature, 99-100°, swelling decreased, went along uneventfully until Dec. 31, when temperature suddenly rose to 104°. Frontal regions again started to swell and on Jan. 2 we elicited definite fluctuation.

Jan. 2: Abscess was incised along right eyebrow. The medial portion of right frontal sinus wall was soft, rough, and necrotic, with a fistula leading from the sinus to periosteal abscess. Patient felt better for a while, but on Feb. 4 his condition suddenly became alarming. He developed aphasia,

distinct neck rigidity, a positive Kernig with clonus and temperature ranging between 103-104°. These symptoms continued for three days and on Feb. 7 they disappeared as quickly as they had come. Temperature was now 99°, pulse regular, patient sat up in bed, fed himself, but had headaches which recurred two or three times a day, and were localized to the left temporal region.

Operation was performed Feb. 10.

Findings: Large amount of necrosis in bony walls. Mucous membrane edematous, dirty grayish in color, and covered with granulation around the medial posterior angle. In curetting the mucous membrane a large part of the posterior wall dropped out because it was loose and necrotic. Behind the bone the dura appeared normal. The nasofrontal duct was permeable to a No. 3 probe and was not disturbed. Convalescence was smooth, the headaches disappeared and there has been no recurrence of brain symptoms. After three months there was no discharge discernible in the nose.

Two years later the child came to me with a history of typical epileptic seizures, first occurring at every other month, later monthly, and then weekly.

This patient had a number of neurological examinations made at specializing hospitals but they were unable to find source of irritation.

SUMMARY.

Case 1 is the ordinary type of sinusitis frontalis with fistula of typical etiology, course and postoperative treatment. In this case part of the intersinus septum was removed and communication established between the suppurating and the normal sinus, without any untoward consequences.

Case 2: The posterior lip of the frontal osteum was traumatized, but the intact anterior lip was adequate to maintain permeability of the duct.

Case 3 was evidently one of rare sinusitis frontales in which every indication seemed to point to primary hematogenous infection of the bone and periosteum and secondary infection of the mucous membranes of the frontal sinus.

Case 4: The posterior wall of the sinus cavity was removed because of evident necrosis and the predominant cerebral symptoms. Two years later patient developed typical epileptic seizures at more frequent intervals. It is possible that child suffered from essential epilepsy or postencephalitis, signs of which we observed prior to operation; but we must give consideration to the suspicion that the removal of the posterior sinus wall and subsequent adhesions may have been the real cause of this epilepsy. Some authors warn against the removal of the posterior sinus wall for the same reason.

CONCLUSIONS.

1. In cases of acute sinusitis frontalis with fistula it is advisable to treat expectantly for a while and avoid radical operation because the percentage of complications and fatalities is high.

2. The above described modified Killian method, in retaining the original nasofrontal duct, gives us good cosmetic results and helps to eliminate the danger of complications and prolonged postoperative intranasal treatment.

3. The fact that epilepsy sometimes occurs following the removal of the posterior sinus wall seems to be substantiated in our Case 4.

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**IS SINUS TROUBLE BEING OVERSTRESSED?
A CRITICAL SURVEY OF THE
SINUS PROBLEM.**

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That sinus trouble is prevalent is quite evident, and that it is becoming more and more frequent is also well recognized. Inasmuch as one of the primary aims in medicine is to reduce disease rather than to increase it, the natural question is: Why is sinus disease so popular? The answer is that it is due to a combination of factors.

First, it has replaced, to a large extent, the old-fashioned expression, "catarrh," which was too common and undignified a term to warrant further consultation, so that where formerly we labeled an acute nose "cold" as acute rhinitis, it is now acute rhinosinusitis. I was surprised, therefore, to note a rather recent book on sinus trouble by the Englishman, Stuart-Low, still titled "Nasal Catarrh."

Second, we have become too pathological-minded. No one can deny that every acute discharging ear is likewise accompanied by some acute, however ephemeral, mastoid involvement. And yet we would hesitate to tell our patients of the intricate pathological invasion of a usually simple middle ear infection, for the mere suggestion of mastoid would make them dread the thought of the gouge. It is just as logical to think of the every-day acute common cold as a contiguous sinus involvement, yet if we place the term "sinus" foremost in their minds, we place these persons in the same category as those with functional heart disorders, by making them focus their constant attention on something which may be either too slight or too fleeting.

Third, it has been blamed as a dangerous focus of infection. This attitude regarding the sinuses, I believe, accounts directly or indirectly for the marked rise in its popularity and will be dealt with separately and at length.

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For the present, just a few words regarding this extraordinary increase in the frequency of sinusitis. Dr. Lyman Richards, of Boston, in examining the clinic records for sinus incidence in his hospital, found "Sinusitis" labeled but four times among 2700 patients treated in 1918 (the year of the flu epidemic); while in 1930, out of 7200 cases, it appeared 266 times, or 23 times more frequently than in 1918. His explanation for this rise was not an actual increase of the disease, but an increased discussion of that ailment. Watson-Williams in a recent treatise has stated that of children requiring tonsil and adenoid operations, 20 per cent have sinusitis. Various authors have given different estimates regarding the incidence of sinus trouble as a cause of general diseases, the figures varying from zero up to 100 per cent. Dr. Willis Manges has recently warned that "nasal accessory sinus disease is one of the most important clinical subjects we have to consider today. It is more frequently overlooked and more inadequately treated than almost any other disease of real consequence." Inasmuch as sinus trouble has become primarily not a nasal problem, but one in which every branch of medicine has traced systemic disorders to and from it, I shall discuss these various aspects of the sinus problem separately.

SINUS AND FOCAL INFECTION.

To what extent a truly infected sinus is a potential or an actual focus of systemic infection, I am not competent to answer. That the role of other supposed foci, such as the tonsils and the teeth, have been partly exploded by Kaiser, Cunningham and others is well known. Even Rosenow himself has been obliged to partly retract from his persistent dogmatic stand with his recent admission, "not too much should be expected from the removal of a particular focus in individual cases."

It is still puzzling to read, therefore, of the disharmony of opinion that still exists as to the status of the sinus as a focus of infection. Imperatori in his very recent book on "Diseases of the Nose and Throat," stresses the role of the sinus as a source of many diseases in lengthy and in no uncertain terms. Cullom, another advocate of sinus as a troublemaker, warns that the sinus is "the real factor in focal infection." On the other hand, we have the report of Ander-

son, who, from a study of 400 consecutive cases of antral sinusitis, has found that it is not a significant factor in focal infection. Barnhill in his recent consideration of "Focal Infection" states that, "a very great many operations have been performed with the view of eradicating foci in an effort to cure secondary disease . . . the operative results have not been as worth while as had been hoped." Likewise, Bloomfield remarks that, "in my experience no definite beneficial effects have resulted in chronic arthritis, hypertension, chronic nephritis, chronic ocular inflammations, etc., from the elimination of remote foci of infection."

SINUS AND EYES.

Some ocular conditions, such as choked disc and retrobulbar neuritis, in which no definite cause could be established, have been either blamed on the sinuses or have warranted exploratory operations for the obvious reason of proximal relationship to orbital structures. More recently, however, certain workers, notably Benedict, of the Mayo Clinic, have taken sharp issue with this point of view. In a study of 225 cases of retrobulbar neuritis, more than 60 per cent of which had undergone intranasal sinus operations without any good whatsoever, Benedict has listed the following reasons for that ocular condition, with multiple sclerosis at the top of the list, and sinus disease accounting for but one case:

Multiple sclerosis	155
Pernicious anemia	14
Diabetes	14
Alcohol and tobacco	28
Syphilis	2
Congenital amblyopia	4
Familial causes	1
Sinus disease	1
Postpartum hemorrhage	1
Plumbism	2
Indeterminate causes	3
Total	225

Whereas retrobulbar neuritis is invariably accompanied by visual field changes, such visual disturbances are not often found even in rather extensive diseases of the sinuses. Moreover, according to Benedict, the lesion is not necessarily

between the globe and the chiasm, but often in the chiasm or posterior to it in the optic tracts or radiations. And yet, Logan Turner has insisted that improvement in vision may immediately follow opening of the sinuses in cases in which eye changes are dependent upon an entirely different cause, such as disseminated sclerosis.

SINUS AND MENTAL DISORDERS.

In past years, a number of psychiatrists have blamed focal infection for mental ailments, and have attributed mental recoveries to sinus or other surgery. That frequent or repeated nose operations may partly account for a mental disorder is not mentioned. The late Dr. Cotton, of the New Jersey State Hospital for Mental Diseases, was a confirmed enthusiast of all forms of radical surgery in mental cases, and his reports were much questioned by Barker and others. More recently the tide has turned regarding the role of focal infection in mental disease. McCowan notes that at the Birmingham mental hospitals, sinusitis is found in over 80 per cent of mental patients, while at Cardiff in only 3 per cent. This discrepancy he places on a different interpretation of the disease in the two places.

SINUSITIS AND INFECTIOUS DISEASE.

That infection in the sinuses often coexists with systemic infections, such as pneumonia, meningitis, erysipelas, and pulmonary tuberculosis, has led certain enthusiasts to blame these disorders on the sinuses. Cullom maintains that "it has long been believed that sinus disease is an etiologic factor in pneumonia, from the high percentage of infected sinuses found postmortem in patients dead of pneumonia. I feel that a case has been made out against infected sinuses that is truly appalling."

To this we may ask, if it is true that sinus trouble coexists with general infections, why accuse the sinus as the offender? Cannot we reason inversely and state that a debilitating disease may secondarily involve the sinuses? Weichselbaum isolated the germs of specific diseases from the sinuses many years ago, such as the pneumococcus in cases of pneumonia. Chronic nasal sinus suppuration has been frequently found to

coexist with bronchiectasis, but Davis is of the opinion that the sinus condition is probably not primary. At any rate, the relationship is obscure.

It is difficult to conceive of a so-called normal sinus as being always free of germs, for every acute cold, however mild, must be accompanied by a concomitant infection of the sinuses. In the same way, if we are to reason bacteriologically, every normal tonsil must be infected.

SINUS AND KIDNEY TROUBLE.

For a long time, infected foci, such as tonsils and teeth and, incidentally, the sinuses, have been offered as causes for certain forms of nephritis, even though such theories have not been supported by ample clinical results to warrant such deductions. That paranasal sinus disease may coexist with nephrosis has been demonstrated by Wimmer. But that an infected sinus may lead to nephritis is something no one has proven. I would therefore agree with Bloomfield when he states, "The causal relationship of such foci of infection to 'systemic' or to remote disease still remains largely *sub judice*, and the evidence in favor of their being responsible for chronic arthritis, arterial hypertension and arteriosclerosis, renal disorders, choroiditis, hepatitis, and other diseases, requires the most careful scrutiny."

SINUSITIS AND ALLERGY.

That an occasional case of asthma or hay fever may be relieved by surgery of the nose may be conceded, but according to Tobey and others, these successful results when observed among a large series of cases were exceedingly few. There is increasing evidence that nasal mucous polyps, formerly regarded as positive indication of sinus disease, are really allergic in origin, and that in spite of the most radical operations there are recurrences. Ionization has been recently adapted to the treatment of allergic nasal disorders, and it is still too early to judge whether the results will prove meritorious. At any rate, largely through the splendid work of Kern and Schenck, of Philadelphia, allergy has confused rather than simplified the sinus problem—let us hope for the better.

SINUS AND MALIGNANT DISEASE.

In line with the current tendency to attribute malignancy to chronic irritation, Wright has advanced the opinion that pre-existing chronic sinus suppuration is a factor responsible for sinus cancer. If that be so, then we should expect more malignancy.

SINUSITIS IN CHILDREN.

The results of nasal surgery in children have not been particularly gratifying. And, whereas a minority of rhinologists are still bent on surgery, others, especially Dean and Vaile, have stressed the medical management, including attention to diet, allergy, habits, fresh air and other nonsurgical methods as being far superior to surgery. Vaile has stated that 80 per cent of cases of chronic sinusitis in children can be cured without operation by suction, heat, argyrol tampons and, if necessary, antrum puncture. Dean rarely finds it necessary to even puncture the maxillary antrum in children.

DIAGNOSIS OF SINUSITIS.

One would imagine that with the X-ray, the microscope, the transilluminator and other diagnostic aids, the diagnosis would be quite simple. As a matter of fact, in the frank case of sinusitis a diagnosis can often be made solely on clinical findings; whereas in other instances even the X-ray and other aids may not tell the entire story. Kern and Schenck demonstrated that quite conclusively from a study of 250 cases, including normal controls as well as those on whom operations had been performed. These cases had been thoroughly examined from every angle.

Given a series of 100 cases, normal and abnormal, it is quite probable that there would be wide discrepancies among different examiners as regards the presence of sinusitis, unless the signs and symptoms are unmistakable. A cloudy sinus on X-ray may mean underdevelopment, thickened mucous membrane without clinical disturbances due to an old healed infection, a tumor or pus. Transillumination may also give us vague findings; yet all these borderline or suspected cases which are loosely included in the sinus category have merely served to make of "sinus trouble" a very elastic term.

The following case reports will serve to illustrate how recklessly the term "sinus trouble" is being used by both physician and layman:

Case 1: A widow, age 69 years. Complaint: "sinus trouble." Has been treated for "sinus trouble" since 1928, until within the past few months when her rhinologist died. Her antra had been punctured several times and a nose operation had been performed. Still complains of the same left frontal headache which makes sleep disturbed. There is no nasal discharge.

Findings: Nose: There is no discharge to indicate any active infection. Part of left middle turbinate has been removed. There is tenderness over the left frontal sinus. This is not a sinus tenderness, but a supraorbital neuralgia which is relieved by the insertion of a cocaine applicator in the nose in the region of the sphenopalatine ganglion.

Ear, throat and larynx negative.

Neck: Above the suprasternal notch is felt a mass the size of a lemon, and indicating a cystic goiter.

Comment: Clinically, this was not a case of sinusitis. There was another angle to the situation which had been overlooked, and that had to do with her thyroid. She presented the symptoms of *thyrotoxicosis* — prominent eyes, tremor of the fingers, constant perspiration of her hands, an *auricular fibrillation* which did not respond to average doses of digitalis, a B. M. R. of +45, and a moderate dyspnea. Moreover, an X-ray of the chest showed a moderate-sized substernal thyroid with displacement of the trachea to the right, and a markedly widened cardiac shadow.

In other words, we were dealing with a serious systemic disorder which made her "sinus complaint" look quite insignificant, and in the light of which a "sinus" headache would appear plausible.

Case 2: A. D., a girl, age 9 years. *History:* Complained of "sinus trouble" which had kept her out of school during the greater part of the past year on account of attacks of high fever, discharging nose and headaches. Had been wandering from clinic to clinic, receiving tampons in her nose, and, on

two occasions, her antra were punctured. Her mother brought her to me regarding a nose operation, which one clinic had just recommended.

Findings: Nose: Fossae are quite patent, suggesting a developing atrophic rhinitis; turbinates are small and no evidence of discharge from sinuses. Eustachian eminences could be clearly seen.

Throat: Tonsils not present, except for remnants of left tonsil. Adenoid tissue palpable in nasopharynx in moderate amount.

Ears negative.

Comment: The adenoids might account for a continual nasal discharge but would hardly explain these high fever attacks. It is difficult to picture such an adenoiditis without at least some involvement of the ears, which this child did not show. The sinuses were similarly ruled out.

Now, getting back to the child, we were dealing with a 9-year-old child weighing 115 pounds, an obese girl with diminished vitality. It seemed logical to focus our attention on her general medical status before making a final verdict on her nose, and the findings clearly indicated pyelitis. The regimen, for the present, consisted not in nasal surgery but in attention to the kidneys and diet.

The disappearance of these fever attacks was striking, and the nose discharge cleared up without attention to the adenoids, or sinuses, or even routine nasal treatment.

Case 3: J. S., male, age 23 years. *History:* Complained of "sinus trouble," consisting of left frontal headaches and dizziness for the past year, coming on almost daily and bearing no definite relation to the time of day. There had been nasal discharge of thick mucous character, but these headaches had occurred without any discharge whatsoever. Patient had also observed an occasional diplopia.

Findings: Nose: slight deviation of cartilaginous septum to left, otherwise negative. There was distinct tenderness over both frontal sinuses, but this tenderness seemed to be false, because other areas over frontal bone were tender too; nor was this a supraorbital neuralgia.

Ears, nose and throat negative.

Comment: False frontal tenderness is something with which we occasionally contend. It is usually mental rather than real.

Diplopia may possibly, although rarely does, occur with an ethmoiditis that has spread to the orbit leading to an orbital cellulitis. This, of course, was too benign a picture. Wassermann test was negative. Eye examination revealed a convergence insufficiency of 25 prism diopters with 3 diopters of accommodation; in other words, a disturbance of his convergence function for near work in which his eyes did not function in unison. For distance, however, his eye muscles performed normally.

So this case of "sinus trouble" was due to a deficiency in the convergence function of the eyes that caused headaches which were misleading.

Case 4: H. D., girl, age 8 years. *History:* Brought to me for what her mother feared was sinus trouble, on account of frontal headaches. Except for occasional nose "colds," there was nothing to lend proof to present complaint.

Findings: No clinical signs of either sinusitis or of discharge in nasal fossae. Tonsils were removed two years previously.

Eye examination showed a refractive error, a compound myopic astigmatism of moderate degree affecting both eyes, the correction of which afforded her the desired relief.

Comment: Obviously, this was a case of sinus fear on the part of the mother rather than of sinus trouble in the child. These cases are quite common, and the parent often appears not for an opinion but with a diagnosis as a complaint. The further course of this case may lend added proof of the fear which parents, and later children, harbor regarding commonly discussed ailments. A year later, the child was brought to me complaining of severe left earache and fulness of three days' duration, and which has disturbed sleep. Examination of the ears was entirely negative, but investigation revealed that her classmate had just been operated on for a mastoid, and this played on her imagination.

Case 5: P. K., boy, age 19 years. *History:* Complained of clogged nose and right frontal headache for one week. Mother

insisted that it was "sinus trouble" and begged that an operation be done, because she had been benefited by a nose operation when she first came to this country. Patient soiled five or six handkerchiefs daily.

Findings: Nose: Right side of nose showed signs of acute purulent rhinitis with extension to right frontal sinus; also discharge seen beneath anterior part of middle turbinate. Left side of nose negative. Slight tenderness over right frontal sinus.

Comment: This was a case of acute frontal sinusitis; but, as far as the mother was concerned, this was an *acute nasal catarrh*, for in the minds of a certain group of laymen sinus trouble means surgery, whereas a "cold" means medicine. Simple treatment with argyrol tampons and suction was sufficient, and the boy was seen twice.

A year later the boy was again brought to me for another nose "cold" but of much milder form. The sufferer seemed to be not the patient, but the mother, who was still bent on action. Besides simple treatment, which was again successful, the best I could offer her was an X-ray picture to appease her imagination.

END-RESULTS OF SINUS SURGERY.

In evaluating the benefits of surgery, it is important to have some idea as to the end-results of nonsurgical treatment as a basis for comparison. The literature is wanting in reports of complications from conservative treatment of sinus trouble, but surgery appears to be not infrequently complicated by dangers. These are: Meningitis: Almost every variety of nasal operation has been responsible for meningitis. In some of these it was due to a fracture of the cribriform plate and in others to failure to remove a plug from the nose. The prognosis of cases of postoperative meningitis is extremely bad, only a few cases of recovery having been recorded. In nonoperative cases the occurrence of meningitis in the course of chronic sinusitis (usually frontal) is quite rare and then usually in addition to some other complication, such as cerebral abscess.

Osteomyelitis of the skull: A spreading osteomyelitis is very serious and practically always follows operation.

Damage to the brain: This most often follows exploration of the sphenoid sinus because of the surrounding meninges, the cavernous sinus and its contents, carotid artery, hypophysis and optic nerve and chiasm.

Even as simple an operation as lavage of the antrum has at times been complicated by severe systemic infection.

Herbert Tilley has well summarized his experience with sinus surgery in the following words: "If an experience of more than a quarter of a century has taught me anything, it is that the number of cases of chronic suppuration of the frontal sinus which call for external radical operations are few. In my earlier practice I saw many patients with chronic frontal sinus suppuration and often advised some external radical operation. Frequently such treatment was refused in favor of simpler, palliative measures. Today, many of these former patients are old men and women who have enjoyed healthy, happy and useful lives."

And, finally, it may appear necessary to drain or to operate on a sinus; such devitalization or removal of bone is never a cure. In some instances there may be an aggravation of a latent, healed or suspected sinusitis due to the attendant trauma and the avenue of infection which is opened through this operative space. This is mentioned to discourage surgery unless the indications are absolutely definite.

CONCLUSIONS.

1. Sinus trouble has become a very elastic term that is being loosely employed by both doctor and layman to include not only sinusitis but also all types and degrees of nasal infections; it has also served as a cloak to explain away obscure headaches, eye complaints and all forms of general disorders.

2. Sinus trouble should better be reserved for those cases presenting sufficient local pathology to require surgical attention; otherwise it is bound to sooner or later fall into disrepute.

3. The role of the sinus as a focus of infection has been much overdone; and the evidence in favor of the sinus as an active focus is insufficient to warrant such undue stress.

4. Surgery, as a rule, is not a cure of sinus trouble and not infrequently is but a prelude to further surgery. Preliminary medical investigation is, therefore, wiser before than after.

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**REPORT OF A CASE OF SEVERE NASAL
HEMORRHAGE CONTROLLED BY
RADIUM APPLICATION.**

DR. J. COLEMAN SCAL, New York.

Persistent and profuse nasal bleeding, if not due to any systematic condition, is usually caused by numerous small superficial dilated blood vessels on both sides of the anterior part of the nasal septum. While the majority of such patients usually respond to the various methods of treatment in the hands of the rhinologist, a great number will continue to bleed despite treatment. In such cases a radium application will be found suitable.

A. D., age 49 years, butcher, referred by a rhinologist because of persistent nasal hemorrhage, which could not be checked by the usual methods. This patient had enjoyed previous good health except for some slight nasal bleeding since adolescence. The bleeding had never been profuse and always easily checked. He had received numerous cuts on his fingers while working as a butcher, but these always healed well and never bled excessively. His tonsils were removed in 1930, with good recovery and no after bleeding. The family history was negative. There were no bleeders in the family except for one brother, who had slight nasal bleeding occasionally.

The present history dates back to May, 1935, when after a number of minor nasal hemorrhages the bleeding suddenly became profuse, necessitating several blood transfusions, which he received at the St. Vincent's Hospital, Jersey City. These were of no effect as the patient promptly lost the blood by nasal hemorrhage.

The patient first called at my office in August, 1935. Examination revealed a tall, heavy man, weighing 210 pounds, with a cachectic anxious appearance. His nostrils were plugged with large strips of gauze, which were saturated with blood. Upon removal of these plugs, both nares commenced

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to bleed freely, ceasing only after application of packs of equal parts of adrenalin and 10 per cent cocain solution, together with stryphnon gauze. After removal of the packs both nares were found full of blood clots, while the mucous membrane was red, inflamed, very sensitive and bled at the slightest manipulation. The septum was found scarred and ulcerated, due to repeated cauterization. Anteriorly on both sides of the septum numerous dilated blood vessels were visible. No growth or nasal polypi were present. There was no pus or clinical signs of sinusitis evident.

Upon consulting the patient's physician, I was told that he had been confined for two weeks in a hospital for secondary anemia and cardiac failure following the nasal hemorrhages. He received two blood transfusions, which stepped his blood count from Hgb., 32 per cent; R. B. C., 2,800,000 to Hgb., 58 per cent; R. B. C., 3,900,000. His blood pressure, which previously had been 170 systolic, was now 130. Blood chemistry showed 110 mgm., N. P. N. and 6.0 Creatinin. A coagulation test showed a good clotting in four minutes while bleeding time was of three minutes' duration.

Treatment by radium application was instituted at once. On Aug. 28, 1935, a capsule containing 25 mgm. of radium element, screened by 2 mm. of platinum and covered with gutta percha tissue, was introduced into the right nares against the bleeding area and allowed to remain for four hours, giving this area 100 millicurie hours of radiation. The same procedure was carried out in the left nares on the following day and subsequently each nostril received another treatment a week apart, until each nares received 300 millicurie hours of radiation.

No reaction followed the radium application. The nasal bleeding was under control during the first week of treatment and stopped entirely at the end of the second week.

Three months after the radium application, the patient was re-examined and both nares were found roomy, while the nasal mucous membrane was covered with dried secretion in the form of scabs over the original bleeding areas. The patient's color was improved and he stated that he had had no further bleeding from his nose.

27 West 96th Street.

A NEW INSTRUMENT—A RETURN FLOW ANTRUM TROCAR.

DR. LOUIS BLUMENFELD, Brooklyn.

Chronic infection of the maxillary antrum is one of the most frequent forms of sinus disease that the otolaryngologist encounters in his daily practice. These infections vary from the simple hyperplastic type with little or no discharge to those diseased antra that are filled with an odorous, purulent discharge and are continuously discharging the overflow from the diseased sinus into the nares. Irrigation of the maxillary sinuses, therefore, becomes a very frequent and at times an indispensable procedure. This treatment, while simple in most cases, is sometimes difficult and, as we shall demonstrate by the following case report, not entirely without danger.

The following case history was taken from the *Monatschrift für Ohrenheilkunde*, of August, 1935. This case was reported by Dr. H. Lowenkron and abstracted by Dr. A. R. Tweedie in the *Journal of Laryngology and Otology*, January, 1936.

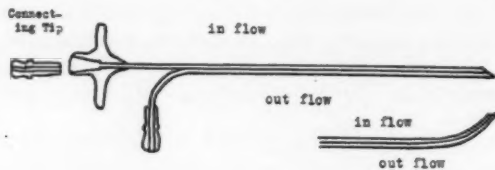
A woman, age 54 years, came to the hospital in the previous January complaining of headache, especially in the left forehead, and a purulent rhinorrhea.

On examination the left lower turbinates were found to be swollen, pus occupied the middle meatus, and since an empyema of the left maxillary antrum was suspected, a proof puncture was performed with the following result:

The needle was introduced through the middle third of the lower meatus without any special difficulty. It was then slightly withdrawn and the free movement of the point in the antrum ascertained. An irrigation of water was then performed but without any previous introduction of air. With the first pressure of the syringe no undue force was required

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to expel a large amount of fetid pus from the nose, but since the patient complained of pain, the irrigation was discontinued. Immediately afterwards, a large painful swelling appeared in the left submaxillary region extending from the angle of the jaw down to the whole left side of the neck. The cheeks, eyes, soft palate and pharynx were unaffected but the left side of the nose became obstructed. Towards evening the temperature rose to over 38° C., but without a rigor. There was great pain in the left side on swallowing and the swelling of the neck had somewhat increased. The following day a spontaneous discharge of pus occurred from the left side of the nose. The left side of the neck was the seat of an emphysema, which extended from the angle of the jaw above to the clavicle below and backwards almost to the midline, while



at the same time the left lateral wall of the pharynx was swollen and an area of the uvula and aryepiglottic fold was also noticed. That evening the temperature rose to 40° C. and for the following days varied between 38° C. and 39° C., while the swelling in the neck gradually increased and extended even to the cheek.

Since extension to the mediastinum was feared, a collar mediastinotomy was discussed, but as no rigor had occurred and the general condition was relatively good, treatment was restricted to expectant palliative measures. The swelling in the soft palate and throat however increased, and on the fourth day a spontaneous evacuation of brown fetid matter occurred in the left pharyngeal wall. As this spontaneous discharge did not appear to give sufficient relief, two days later an incision was made externally in the neck, when a large abscess cavity was found containing almost half a litre of fetid pus. With this the local condition gradually resolved and the patient was able to be discharged after a month in the hospital.

It would appear from the sequence of events that the puncture needle must have entered the pterygopalatine fossa, and yet it was difficult to understand how this could have occurred, since only some 2 ccm. of fluid were introduced with a syringe, and immediately resulted in the easy discharge of purulent fluid from the antrum.

Another explanation was the possibility that the posterior wall of the antrum was ulcerated and infection was thus introduced.

A short summary of various complications following puncture of the antrum, including even fatalities, was given by the exhibitor and various speakers added their commentary and own experience in this connection.

From the above reported case one can see that any instrument that will add to the safety of this procedure is a welcome addition to the armamentarium of the otolaryngologist. If this instrument at the same time improves the diagnostic and therapeutic value of sinus irrigation it becomes an important and useful addition to our surgical tray.

I have made a return-flow antrum trocar similar to the drawing appearing with this article. It consists of two narrow tubes, one tube for inflow, and the other for outflow. The point of the trocar is so cut and beveled that the outflow tube is the most distal end of the tubes. This is a very important factor in this instrument.

POINTS OF SUPERIORITY OF THE RETURN FLOW ANTRUM TROCAR.

1. *Greater Safety Factor:* If the pointed tip of the trocar touches the distal wall of the antrum, the inflow opening is still within the cavity of the maxillary antrum, thus preventing the infiltration of the tissue with fluid.

2. *Greater Safety Factor:* If the distal wall is accidentally perforated by both tubes and the fluid is forced into the soft tissues, the fluid will return through the return flow tube and prevent the usual edema, pain, and possible infection that may result from the retention of fluid in the tissues.

3. *Diagnostic and Therapeutic Factors:* Uncontaminated antrum washings can be easily obtained from the return flow

tube directly into a sterile test tube or into any media for the production of an autogenous vaccine.

4. The return flow trocar in no way disturbs the usual method of antrum irrigation where the returning fluid escapes through the natural openings. In fact, it aids it by making the escape of fluid easier through the addition of another outlet.

5. *Suction Irrigation:* This trocar may be used for suction irrigation. This will result in a more thorough cleansing of the maxillary antrum. The irrigating fluid may be introduced by the usual type 3 oz. syringe or by the gravity method. By using the suction method most of the fetid odor is retained in the vacuum bottle and does not diffuse into the operating room.

1564 St. Marks Avenue.

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IN MEMORIAM

DR. JOHN SMITH FRASER.

1874-1936.

Dr. John S. Fraser, of Edinburgh, was born Dec. 4, 1874, at Springfield, Cupar, Fife, where his father was medical superintendent of the Fife District Asylum. Educated at George Watson's College and then at Fettes College, he began the study of medicine at the University of Edinburgh and graduated M.B., Ch.B., in 1897, with first class honors. His first assignment was as resident house physician and surgeon at the Royal Infirmary of Edinburgh. He spent five years in general practice at Lichfield and in 1904 decided to specialize in otolaryngology, spending a year in London and Vienna in graduate work in this field. In 1905, he was clinical assistant in the ear and throat department of the Royal Infirmary of Edinburgh and the same year passed his examination for Fellowship in the Royal College of Surgeons of Edinburgh. In August, 1906, he was appointed assistant surgeon of the ear, nose and throat department of the Royal Infirmary and in 1921 was promoted surgeon, a position which he held until his death. For 15 years he was lecturer on diseases of the ear, nose and throat in the University of Edinburgh.

Dr. Fraser died in Edinburgh May 11, 1936, after a protracted illness.

For 30 years his unusual talents as a clinician, serious student and expert laboratory worker were productive in the development of many problems, especially in the pathology of diseases of the ear, and his numerous contributions to the literature of this field have always marked him as an outstanding authority. His most important contributions have been made in the clinical study and microscopic pathology of congenital deaf-mutism, congenital syphilitic diseases, tuberculous affections of the ear and otosclerosis.

As a contributor to the literature on otolaryngology, his clinical and pathological articles always showed careful prepa-

ration and evidence of keen observations. He was a popular teacher of otolaryngology and his terse and comprehensive clinical lectures and pathological demonstrations were always of high quality. He was fearless in the expression of his scientific opinions, logical in his conclusions, reliable in his wide experience and candid in his criticisms.



J. S. Isaac.

In 1922 he received the Liston Victoria Jubilee Prize, awarded quadrennially by the Royal College of Surgeons of Edinburgh for meritorious contributions to practical surgery; in 1929, he was awarded the Freeland-Barbour Fellowship by the Royal College of Physicians of Edinburgh, and in 1930,

the Norman Gamble Research Prize in Otology, of the Royal Society of Medicine, London.

He was president of the Section on Otology of the Royal Society of Medicine, London, and president of the Section on Laryngology and Otology of the British Medical Association in 1934. He was an honor member of the Austrian and American Otological Societies and of the Otological Society of Madrid, and was a corresponding member of the American Laryngological Association.

He was active in tennis, a golfer of no mean ability and fond of angling.

He is survived by his wife, a daughter of Maj. Ludwig Reichsritter von Bouvard, of Vienna; his two sons are graduates, with honors, of the University of Edinburgh, one in science and the other in medicine. To his family we offer our sincere condolence.

Jack Fraser not only endeared himself to his intimates, but had the respect of the entire otological world for his accomplishments, his original work, his fine spirit and enthusiastic support of the most dignified interests of his profession. Of him it may truly be said: "He was nature's nobleman."

M. A. G.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY.

Meeting of April 20, 1936.

Report of a Case of Lattice Keratitis. Dr. H. C. Smith.

Under such names as superficial linear, letter-shaped and lattice keratitis has been described an affection which is typified by gray ridges running in straight or curved fashion in the superficial layers of the cornea. Except when the condition has arisen following injury, no cause for its occurrence has been found. Its onset is acute, accompanied by considerable pain and more or less circumcorneal injection; and it runs a course of from a few days to weeks, with gradual cessation of symptoms.

The changes in the cornea have been attributed to inflammation of the corneal nerves, but more frequently are considered to be due to folds or ruptures in Bowman's membrane. The lines, or ridges, are covered with epithelium, and do not stain with fluorescein, except, perhaps, at points where a nodular enlargement appears in their course. This, and the regular straightness of their formation would differentiate superficial linear keratitis from dendritic keratitis.

The case reported occurred in a female, white, age 40 years. She had complained of neuritis in the left shoulder several days before the left eye suddenly became painful. When seen, 12 hours after the onset, the left cornea appeared superficially steamy and there was mild circumcorneal injection. Corneal sensitivity was not diminished. There was no pupillary change and the iris seemed normal. Intraocular tension, to fingers, was normal. Within six hours, the right eye was similarly affected and photophobia was extreme. Atropine, dionin and hot compresses were prescribed and a search for septic foci was begun.

On the second day lattice-like markings were visible in the left cornea. These appeared on ophthalmoscopic examination; and, with the slitlamp, they seemed to be gray ridges running just beneath the epithelium. They were heavy in the central cornea and tapered toward the periphery. On the third day similar changes appeared in the right cornea.

No systemic cause for the ocular condition was found and the internist suggested that, in view of the fact that the patient was suffering with neuritic pain in the shoulder, she be given cinchophen intravenously. Beginning on the second day of observation, she was given five injections of sodium iodide (gr. viiss), sodium cinchophen (gr. xvss) and sodium salicylate (gr. xvss) in 20 cc. distilled water at three-day intervals.

The fourth day, the markings were noticeably less dense, and they rapidly disappeared; however, the cornea remained somewhat steamy, particularly at the margins, for 10 days. The subjective symptoms subsided more gradually than did the objective ones.

The original local medication was continued two weeks, after which dionin was used alone for four weeks.

There has been no recurrence of the disease during 22 months.

In reporting the case under the heading, "Lattice Keratitis," various writers have given that name to a chronic corneal condition, which is a familial dystrophy. The term "lattice" has been chosen because it more nearly described the configuration of the corneal markings than does any other, and because the term has been in use to describe both the acute inflammation and the dystrophic corneal change.

NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTO-LARYNGOLOGY.

Meeting of March 18, 1936.

I.—Presentation of Cases and New Instruments:

Laryngectomized Patients Phonating without Mechanical Aid. Dr. George Renfrew Brighton.

Two cases of complete laryngectomy were presented, illustrating the physiology of phonation.

A Sixty Cycle Faradic Stimulator. Dr. Edmund Prince Fowler, Jr.

A simplified Faradic stimulator was presented. It was suggested that some sort of Faradic stimulator should be available during all mastoid operations. In case of question of exposure of the facial nerve, such as often takes place during radical mastoid operations, an electric stimulator should be used to locate the exposure instead of trauma by means of an instrument. The instrument used in the Presbyterian Hospital consists of a transformer with suitable resistance. This is plugged into an ordinary 110 A.C. circuit, and permits minimum stimulus currents to be obtained. The old-fashioned inductoria are less reliable because they require batteries, and due to the vibrator, give inconstant potentials.

Demonstration of New Type of Tracheotomy Tube. Dr. John S. Mikell.

(To be published in a subsequent issue of THE LARYNGOSCOPE.)

II.—Case Reports:

Case of Actinomycosis of the Left Antrum Treated by Diathermy. Dr. John D. Kernan.

L. L., male, age 57 years, had been affected for 20 years by swelling in the region of the left antrum, with a gradually increasing blocking of the left nostril, and the formation of fistulae under the left eye, through the left cheek, and the right side of the nose. The organisms of actinomycosis had been discovered in the discharge.

In 1930, when this man first came to us at the Presbyterian Hospital, there was a brawny swelling of the left cheek, the left antrum was filled with bleeding friable material, and a fistula in the left cheek, also through the right side of the nose. He had been given as treatment massive doses of Ki, X-ray, curettement of the fistulae without improvement.

The treatment, which was undertaken following his admission to the Presbyterian Hospital, consisted of systematic destruction and removal of all of the pathological material by means of the coagulating current. He was under this treatment for seven months and underwent nine coagulations. Ultimately, practically all of the left maxilla and septum of the nose had to be removed and the whole left ethmoid region. You can see now that he has a large clean cavity widely open on the face and into the mouth.

The next step should be the plastic closure in the opening in the face and the fitting of a plate to close off the mouth from the nose. Unfortunately, the

man is in poor condition, due to other causes than the actinomycosis, which will probably prevent the completion of these procedures.

This child, B. A., age 13 years, came to us complaining of a little difficulty in breathing, swallowing, and talking. She had been hoarse since infancy. Examination revealed a large swelling of the right arytenoepiglottic fold, filling the pyriform sinus of that side. Through the direct speculum an incision was made into this mass, the idea being that it was an abscess. Turbid, glairy fluid was released. Several days later she came back with acute dyspnea. The inflammatory reaction was so severe that she required a tracheotomy for relief. Subsequently, the supposed abscess was drained by the approach through the right thyroid cartilage, a procedure devised by the author and Dr. Henry Schugt. Although the cavity was easily entered, it was found impossible to get the fistula to heal, until it was realized that we were dealing with a cyst and not an abscess. The fistula was then injected with urethane and quinine. This resulted in a prompt healing of the fistula and disappearance of the swelling.

The lesson to be learned from this case is that a diagnosis of cyst rather than abscess should be always considered in connection with long persistent swellings in the larynx. Withdrawal of the fluid through a needle and its replacement by sclerosing fluid, such as was used in this case, is better treatment than incision and drainage for such cases as this.

DISCUSSION.

DR. LOUIS HENRY CLERF: Dr. Kernan is to be congratulated on the very excellent results he has secured in these cases. Few of us have an opportunity to see actinomycosis; we rarely will see a case that responded as beautifully as this did. I agree with Dr. Kernan that this is an excellent specimen on which to study the anatomy of the nasal fossa.

The case of the cyst of the larynx presented an interesting problem. In the first place, it is undoubtedly congenital in origin as the symptoms dated from birth. I have in mind a girl, age 18 years, on whom I operated by the external route, who also had been hoarse since birth. Second, these cysts are lined with columnar epithelium. Any plan of treatment that does not remove or destroy completely the epithelial lining will be unsuccessful.

Dr. Kernan's case is particularly interesting because of the successful result secured following injection into the cyst of a sclerosing fluid. If one can destroy the lining epithelium by a sclerosing fluid this would seem to be an excellent plan of treatment.

Congenital Stenosis of Larynx. Dr. George Hunter O'Kane.

(To be published in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. CHEVALIER LAWRENCE JACKSON: This case presented by Dr. O'Kane is a very important one for us to consider, not only because it represents an interesting case and a life saved, but because it emphasizes the importance of direct inspection of the larynx in infants who have some trouble in breathing. In the great majority of infants who have a stridor of one degree or another, either inspiratory or expiratory or both, the condition is not serious. In by far the greater number of cases the symptoms are due to flaccidity of the epiglottis and aryepiglottic folds, a condition which rarely requires a tracheotomy or any other surgical intervention and is soon outgrown. In a number of cases, however, a serious obstructive condition, such as was present in Dr. O'Kane's cases, would be overlooked if direct inspection were not done.

I have had an opportunity to see a number of infants and young children in consultation with the Pediatric Department of the Temple University Hospital. One of the men on the staff became interested in this question of stridor in infants, and he has referred to me for direct laryngoscopy every child who has come in with even slight stridor. Among them was one who had a definite subglottic web stenosis. The child, age about 1 year, had had trouble in breathing since birth. When I saw him, he had a serious upper respiratory infection. Direct laryngoscopy showed a subglottic web just below the anterior commissure. It was possible to pass a small bougie but it was not possible to relieve the condition sufficiently by dilatation. We did a tracheotomy and the child is still wearing the tube, but he is now breathing with a partial cork. We hope to decannulate him shortly.

Another case is described in our chapter in Dean Lewis' "Practice of Surgery," Vol. IV, Chapter 7, as a "typical case" of congenital stenosis of the larynx. Dr. Jackson, Sr., saw this patient in a Pittsburgh hospital. The obstetrician was unable to establish the infant's breathing satisfactorily, and sent for Dr. Jackson, who was working in an adjoining operating room. He found a web just below the anterior commissure but was able to get a 3 mm. bronchoscope through this web. He prepared to do a tracheotomy, but first tried removing the bronchoscope. Relief from dilatation proved sufficient and it was not necessary to do the tracheotomy. Dr. Jackson had an opportunity to see this child again at the age of 6 years, at which time "mirror examination showed a pair of vocal cords that seemed slightly thickened, but otherwise not far from normal, and the voice was good."

In the last sumer of the Journal of the American Medical Association is an article by Dr. McGrath and Dr. Kuder, of New York, on the subject of resuscitation of the newborn. To those of us who are interested in this subject, it is noteworthy to see the emphasis these writers place on the importance of direct inspection of the larynx for the aspiration of secretions and meconium, as well as for the detection of obstructions of the larynx and trachea. Of course, Dr. Paluel Flagg, also of New York, has been one of the pioneers in emphasizing the necessity for this type of examination and treatment in the newborn.

Just one word more. I feel that in the case of Dr. O'Kane's patient there will be no trouble in getting rid of the tracheotomy tube as the child gets a little older. Growth of the larynx is an important factor in the management of laryngeal stenosis in children, and it is favored by first partial and later complete corking. With gentle dilatation and progressive corking, it will certainly be possible to accomplish decannulation.

Nonmalignant Neoplasms of the Larynx. Dr. George Renfrew Brighton.

(To be published in a subsequent issue of THE LARYNGSCOPE.)

DISCUSSION.

DR. GABRIEL TUCKER: I wish to congratulate Dr. Brighton on his excellent presentation. As with most statistical papers, there is little for discussion and very little to add or criticize.

However, there is another class of tumors of the larynx which is not classed as neoplastic, but as inflammatory tumors. These tumors are very important and I have been particularly interested in them. They should be considered for differential diagnosis in all cases where a tumor exists. Any irregularity or localized swelling on the cord we must regard as a tumor. As Dr. Brighton has said, the proper way in which to make a final differential diagnosis is by a histologic examination of the tissue after removal of the tumor. Direct laryngoscopy is the method of choice in the removal of excessive tissue in making a diagnosis. If the tumor is inflammatory, we remove sufficient to restore the normal contour of the cord. It is probable that any tumor mass on

the cord creates a local point of irritation and that a vicious circle is established in which an over-acting musculature is developed, which increases the local irritation and is an important factor in the increase in size of the tumor. The possibility of the inflammatory tumor mass becoming malignant due to continued irritation is also a matter for consideration. Certainly, the patient is much better off to have the tumor removed by direct laryngoscopy and the normal contour of the cord restored.

Dr. Brighton has mentioned another point which is most important in these cases of inflammatory tumor as well as in the neoplastic cases and that is the matter of re-educating the patient in the proper manner of tone production. If there has been a tumor of the vocal cord and it has been present for a period of months or years, the patient has produced his tones by overacting musculature, and after removal of the tumor he will continue to use the same mechanism for voice production and in order to overcome this he must be re-educated in his method of tone production. The first step is to put these patients on absolute vocal rest. Putting the vocal cord at rest acts as a splint and favors healing of the denuded area. In re-educating the patient it is necessary to guard against over-use of the muscles of the larynx.

The occurrence of malignant change in papilloma is not infrequent and many cases have been reported in which a biopsy has shown chronic inflammatory tissue with hyperplasia of the epithelium, and a second biopsy done at a later date on this same location is reported as carcinoma. Some pathologists will go so far as to say the lesion is precancerous. Certainly, where there is a suspicion that the lesion may become cancer, the laryngologist should be careful in his follow-up to see the patient frequently and do a second biopsy if there is any suspicion that the character of the lesion may have changed. In postoperative laryngofissures it is my custom to insist on the privilege of examining the patient myself at least once a month during the first year and usually these follow-up examinations should continue over a period of two or three years. Wherever a suspicion exists, tissue is removed for biopsy. In this way we have been able to pick up recurrence after laryngofissure very early and in a number of instances I have been successful in curing the patients by a second laryngofissure. The follow-up in benign tumors of the larynx should be just as careful as in the malignant cases.

In the direct laryngoscopic method as described by Dr. Jackson, the redundant tissue of the cord is scalped off. I think it is well to emphasize that this should be scalping and not biting into the normal tissue on the cord. The removal of the normal cord structure will mean scar formation and scar formation in the vocal cord means more or less impairment of voice, depending upon the extent of the scar.

Radiotherapy in Oto-Laryngology. Dr. Maurice Lenz.

(To be published in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. KARL KORNBLUM: I would like to preface my remarks by telling you of the perfectly splendid time I have had this afternoon and evening. I spent the entire afternoon in the radiological department at the Presbyterian Hospital, and what I saw there more than repaid me for the time I have lost away from Philadelphia. The courtesy showed me by Dr. Lenz and Dr. Golden and members of their staff was certainly most gratifying. I know that it is not necessary for me to tell the New York group of the merits of Dr. Lenz's work. I am quite sure he has already sold himself to you. But for the benefit of my Philadelphia colleagues, I would like to say that you have just heard a presentation which is authoritative in every respect. Dr. Lenz is regarded in radiological circles as an expert in radiotherapy, and particularly in the treatment of lesions of the nose and throat.

There are today three distinct groups of malignant lesions, the results of which, from the standpoint of irradiation, make this form of treatment the method of choice. These three groups are, first, cancers of the skin; second, the malignant lesions of the uterus; and third, the oto-laryngological malignancies. You have heard this latter group presented so thoroughly by Dr. Lenz tonight, there is very little that I can add to what he has already said. I wish merely to emphasize three factors that to my mind are the crux of the entire situation. These factors are, first, the importance of co-operation between the oto-laryngologist and the radiologist; second, the necessity for adequate irradiation therapy; and third, consideration of the most important fact regarding treatment and prognosis in malignancy.

The necessity and importance of team work between the oto-laryngologist and the radiologist cannot be too strongly emphasized. It must be recognized by the oto-laryngologist that most of the malignant lesions falling within his specialty are not amenable to surgery alone, and therefore, it is necessary for early consultation with the radiotherapist so that a rational plan of treatment may be outlined without loss of time and before meddlesome and harmful procedures can be carried out. There are some lesions, of course, where only radiation can be employed, but there are some lesions where a combination of radiation and surgery can be best employed in the hope of effecting a cure. It is now recognized that irradiation prior to surgical treatment is the procedure of choice. Irradiation before surgery will often render an inoperable tumor operable. Close observation by the clinician during and after irradiation therapy should be insisted upon. He should become acquainted with the progressive changes in the lesion and in the surrounding tissues, and with the patient's systemic response while under this form of therapy. Especially is this true of those lesions not directly accessible to inspection by the radiotherapist, as in the hypopharynx and larynx. All patients receiving irradiation therapy in this group of cases at the Graduate Hospital in Philadelphia are seen at least once a week by Dr. Gabriel Tucker who reports to us the extent and degree of reaction. As soon as that reaction is marked, irradiation is discontinued, regardless of the amount of radiation that has been given or the effect upon the skin. We have learned from experience that only co-operation of this kind can give the best results.

The second factor is the necessity of giving adequate irradiation. Until recent years, irradiation in general was wholly inadequate. We are greatly indebted, in the treatment of lesions of the head and neck, to the pioneer work of Prof. Coutard, of Paris, who has demonstrated the necessity for more intensive irradiation if we hope to control lesions in this part of the body. He has shown us that severe reactions in this part of the body are absolutely necessary if adequate therapy is to be given. In this country we have been restrained in the use of adequate treatment by our fear of so-called X-ray burns and our fear of resulting litigation. We have learned that the normal skin and mucous membranes will recover from these severe reactions without permanent damage. The importance to the clinician is that he should follow these irradiation reactions, so that he may help in allaying the fears of the patient, and give such professional encouragement as is so necessary to patients receiving intensive irradiation.

Finally, there is the consideration of the factors influencing the treatment and prognosis in malignancy. The pathologists emphasize the importance of the histological structure of tumors and insist upon the accurate grading of all malignancies. I recognize that this is a step in the right direction and I am interested in the histological structure and in the grading of all tumors coming under my observation. Dr. Lenz has spent considerable time in telling us of the radiosensitivity of tumors, but from the practical standpoint we cannot, from our present knowledge, permit the histology of a tumor or its radiosensitivity to unduly influence our therapy or our judgment in regard to the prognosis. In treating cancer I am influenced by two factors. These are the tolerance of the local tissues and the tolerance of the patient to irradiation. In other words, irradiation is carried to the point where the local tissues will

tolerate no more without the danger of irreparable damage, or the patient's systemic reaction is such that further irradiation would be decidedly harmful. In the present state of our knowledge we cannot apply irradiation in any other manner. We also hear much propaganda about the early detection of cancer. We all recognize that this is a matter of vital importance, but whether a tumor is curable or incurable is not so much dependent on its early detection, as on its accessibility to our therapeutic measures. Brain tumors, for instance, which are histologically benign and even though detected in their earliest stage, offer in the majority of cases a grave prognosis because they are inaccessible to our therapeutic measures. As soon as a tumor has infiltrated the surrounding tissues and spread to the regional lymph nodes, it immediately becomes less readily accessible and less susceptible to therapy. The reason a certain degree of success has attended our treatment of lesions of interest to the oto-laryngologist is because many of these lesions are accessible to surgery, or surgery in combination with radiotherapy, or radiotherapy alone; therefore, I would like to emphasize that therapeutic accessibility is by far the most important factor in the treatment and prognosis of malignant disease.

Acoustic Tumors within the Internal Auditory Meatus. Dr. E. P. Fowler, Jr.

(To be published in a subsequent issue of THE LARYNGSCOPE.)

DISCUSSION.

DR. BENJAMIN HARRISON SHUSTER: When I was asked to discuss a paper on acoustic neuromas by Dr. Fowler, I accepted, although I did not know just what he was going to say about the subject. Thinking, however, that it was Dr. Fowler, Sr., who was going to read the paper, I had a faint suspicion that he would emphasize the auditory phase of the subject and I felt somewhat confident that I might have something to say on the subject. All of us know the arduous work Dr. Fowler, Sr., has done on the ear and in the interest of the hard-of-hearing. When I found that Dr. Fowler, Jr., was going to read the paper, I was somewhat nonplussed. I could not suspect what he had in his mind. Although he did emphasize the auditory phase, he mentioned, in addition, a lot of technical neuropathology, which to me does not mean very much.

Dr. Fowler mentioned that patients with acoustic neuromas go to the otologist first. Perhaps they do not come to us as often as to the internist. They come to us because they have some tinnitus which the internist cannot explain on a medical basis. When we get these cases we do not know whether it is an acoustic neuroma or a Ménière's syndrome or a toxic disturbance which is causing the patient's symptoms; therefore, we do not always think of the diagnosis of acoustic neuroma because it is hard to diagnose in the early stages. Certain things may be suggestive. For instance, not long ago Dr. Northington wrote two papers, one on acoustic neuromas and another on a group of cases of Ménière's syndrome. The characteristic thing which struck me in both these papers was that in the acoustic neuroma, the vertiginous symptom was not so important. The patients did not care about a little dizziness. They did complain bitterly, however, about the tinnitus and deafness. On the other hand, the patients with Ménière's disease did not care about the tinnitus but were most concerned about the dizziness. That may help us. When a patient complains of dizziness, we can think of some toxic cause, while on the other hand, if the tinnitus is more important it may mean an acoustic neuroma. Dr. Fowler's data on early tumors which he found might be of value to the neurosurgeon to induce him to operate early enough to give the patient relief. All operations on acoustic neuromas in the stage in which they are usually done are more or less valueless, as far as the patient's life is concerned. They make him more comfortable for a time but recurrences occur and a fatal termination is inevitable.

However, we have some diagnostic methods which make a diagnosis in the early stages possible. I refer to the vestibular tests. The neurosurgeons will not accept these results. A short time ago, for instance, I had a patient with some tinnitus and headache and the vestibular tests showed a dead labyrinth on that side and perversion from the horizontal canal on the opposite side. It seems to me that these things can occur as a result of a very small tumor of the acoustic nerve, perhaps causing a localized arachnoiditis and producing signs of increased intracranial pressure. I took this patient to Dr. Grant and told him that the patient appeared to have vestibular signs characteristic of an acoustic neuroma and what was he going to do about it? He said if I wanted him to operate he would, but he would rather wait. He could not find any corneal anesthesia or other neurological signs. I do not blame him for his stand, for, after all, he has the responsibility for the life of the patient, but it seems to me that if we could collect a sufficient number of such patients, and convince the neurosurgeons that acoustic neuromas can be diagnosed in an early stage when they are small in size, they might begin to look at these tests as of some value and accept them as they do a corneal anesthesia. With work such as Dr. Fowler has given you, plus vestibular examinations, co-operation with the neurosurgeons may get us somewhere.

I appreciated Dr. Fowler's paper, and although I did not know what he was going to talk about, I certainly learned a great deal.

AMERICAN OTOLOGICAL SOCIETY, INC.

The Sixty-ninth Annual Meeting of the American Otological Society was held under the presidency of Dr. Francis R. Packard, of Philadelphia, at the Book-Cadillac Hotel, Detroit, Mich., May 28 and 29, 1936. There were present 52 Active, one Senior and four Honorary members, as well as 56 guests. The scientific program, which included one full day devoted to an exhaustive symposium on Bone Conduction, fully equalled in the estimation of those present the high excellency of the programs of previous years. The hospitality of the Detroit members was most generous and contributed much to the success of the meeting.

The following were elected Active members: Dr. Kenneth Mosier Day, Pittsburgh, Pa.; Dr. Harry Paul Schenck, Philadelphia, Pa.; Dr. Horace James Williams, Germantown, Phila., Pa.; Dr. Karl Musser Houser, Philadelphia, Pa.; Dr. Claude T. Uren, Omaha, Neb.; and as Honorary members Dr. Frederick L. Jack, of Boston, and Harvey Fletcher, Ph.D., of New York, N. Y.

Dr. Edmund P. Fowler, Dr. Harris P. Mosher, Dr. Thomas J. Harris, Dr. Francis R. Packard, Dr. Samuel J. Crowe, Dr. Isidore Friesner and Dr. Horace Newhart were elected members of the Council for 1936-37.

The Council elected as officers for the ensuing year, Dr. Edmund P. Fowler, President; Dr. Harris P. Mosher, Vice-President; and Dr. Thomas J. Harris, Secretary-Treasurer.

The Society has lost by death during the past year three Active members: Dr. D. Campbell Smyth, Boston, Mass., June 11, 1935; Dr. J. J. Thomson, Mt. Vernon, N. Y., Nov. 13, 1935; Dr. Arthur B. Duel, New York, N. Y., April 11, 1936. One Senior member: Dr. Franklin C. Capron, Providence, R. I., Dec. 16, 1935; and three Honorary members: Dr. Albert A. Gray, London, England, Jan. 10, 1936; Sir Charles Bal-lance, London, England, Feb. 9, 1936; Dr. Edward B. Dench, New York, N. Y., Feb. 21, 1936.

Dr. Mosher reported for the American Board of Otolaryngology that the Board has held two regular examinations during the year and had issued in all 2370 certificates. A total of 168 men was examined, of whom 129 were certified.

AMERICAN LARYNGOLOGICAL ASSOCIATION.

The Fifty-eighth Annual Congress of the American Laryngological Association was held at the Book-Cadillac Hotel, Detroit, Mich., on May 25-26-27, 1936, under the presidency of Dr. Burt R. Shurly.

Mr. Herbert Tilley, of London, was elected to Honorary Fellowship; Dr. John S. Fraser, of Edinburgh, Scotland, and Dr. Jacques Vialle, of Nice, France, to Corresponding Fellowship; Dr. Joseph M. Goodale and Dr. Henry L. Wagner to Emeritus Fellowship; the applications of Dr. John F. Barnhill and Dr. Thomas J. Harris for reinstatement from Emeritus to Active Fellowship were approved; and the following were elected to Active Fellowship in the Association: Dr. Howard C. Ballenger, Chicago, Ill.; Dr. Thomas C. Galloway, Evans-ton, Ill.; Dr. Gordon F. Harkness, Davenport, Ia.; Dr. Francis E. LeJeune, New Orleans, La.; Dr. Dean M. Lierle, Iowa City, Ia.; Dr. Harry W. Lyman, St. Louis, Mo.; Dr. Gregor McGregor, Toronto, Ont.; Dr. Bernard J. McMahon, St. Louis, Mo.; Dr. Wm. James McNally, Montreal, Que.; Dr. Lyman G. Richards, Boston, Mass.; Dr. Harry P. Schenck, Philadelphia, Pa.; Dr. Walter Stevenson, Quincy, Ill.; Dr. Antonie P. Voislowsky, New York, N. Y.; and Dr. Fletcher D. Woodward, Charlottesville, Va.

The following officers were elected: President, Dr. William B. Chamberlin; First Vice-President, Dr. William P. Wherry; Second Vice-President, Dr. Harold I. Lillie; Secretary, Dr. James A. Babbitt; Treasurer, Dr. Charles J. Imperatori; Librarian and Historian, Dr. George M. Coates; First Councillor, Dr. Joseph B. Greene; Second Councillor, Dr. Horace Newhart; Third Councillor, Dr. Dunbar Roy; and Fourth Councillor, Dr. Burt R. Shurly.

The program for the Fifty-ninth Annual Congress is already under way. Will all Fellows desiring to present papers *please communicate promptly* with the Secretary.

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